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SINCLAIR QL WORLD

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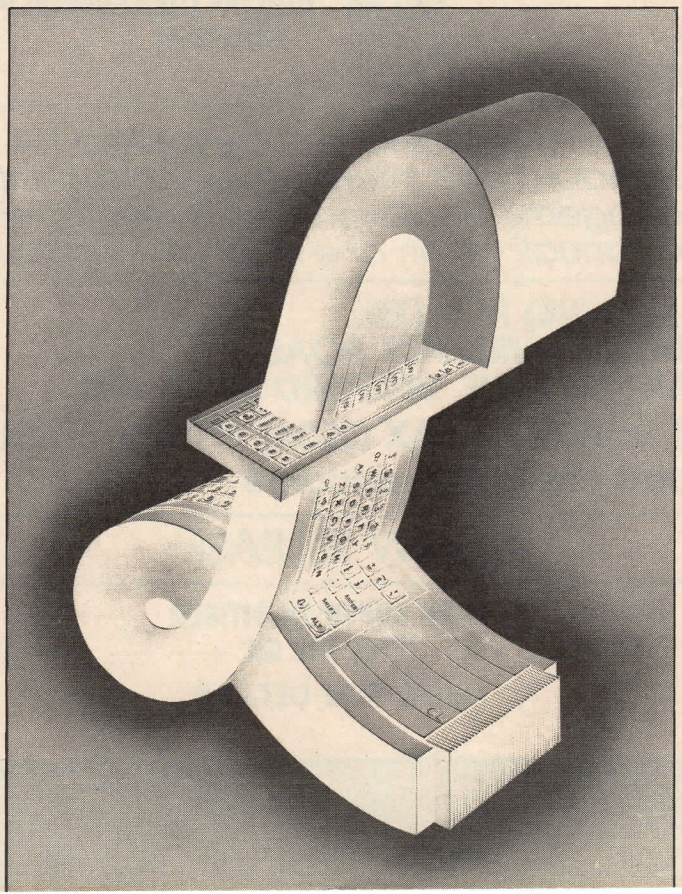

NEXT MONTH

The business

Our in-depth analysis of financial and business software has been consigned to the QL safety deposit box for a month due to the long-anticipated arrival of Turbo which has taken its place in this issue. All things financial will be revealed next month.

Trivia

We will be looking at the new Talent PCB design software and, also on the drawing-board is a review of colour plotters. Ron Massey will be checking the options for those who want to acquire a disc drive without breaking the bank and for those who prefer more Trivial pursuits we will be trying the new quiz game from Talent.

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by L. Hirschbiegel

A flexible, attractive and user-friendly front-end system for your QL. The program uses a combination of icons and drop-down menus to call up system commands and can be operated from the keyboard or used with the ABC mouse. Includes a wild-card file option and a sub-directory device driver. thus making all other files on the medium completely transparent to QDOS.

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QL TOOLSET

by Barry Silver

The package consists of over 100 extensions to SuperBASIC, which greatly increases the QL's file handling and graphic capability. The package is designed to save hours of tedious coding and will help you to carry out any task in SuperBASIC faster than you had thought possible!

A really useful addition to your library!

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SIDEWAYS

by N. Clift

This useful program prints everything sideways. It's ideal for spreadsheets or any text file which is wider than your printer paper.

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A comprehensive instruction manual accompanies the package.

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QL SCENE

CP/M for the QL

Ultrasoft has announced the imminent release of a CP/M operating system for the QL. CP/M is possibly the world's most widespread operating system and literally thousands of applications run under it including *WordStar, Multiplan* and *DBase II.*

The CP/M emulator is entirely software-driven and will be supplied on an EPROM cartridge. It will run on a standard 128K machine using either Microdrives or floppy discs. Terminal emulation allows the use of full screen editors and it features what Ultrasoft call an enhanced console command interpreter with line editing.

The arrival of CP/M for the QL could be heralded as the most significant software development since the QL was launched. Although the Z-80-based operating system is considered somewhat long in the tooth, the profusion of programs available makes it an attractive proposition. It will also be possible for programmers to develop CP/M-based applications for other machines.

Organiser sales top £1 million a month

Psion, the company responsible for writing Quill, Archive *et al,* has announced sales figures of more than £1 million per month for its Organiser II pocket computer.

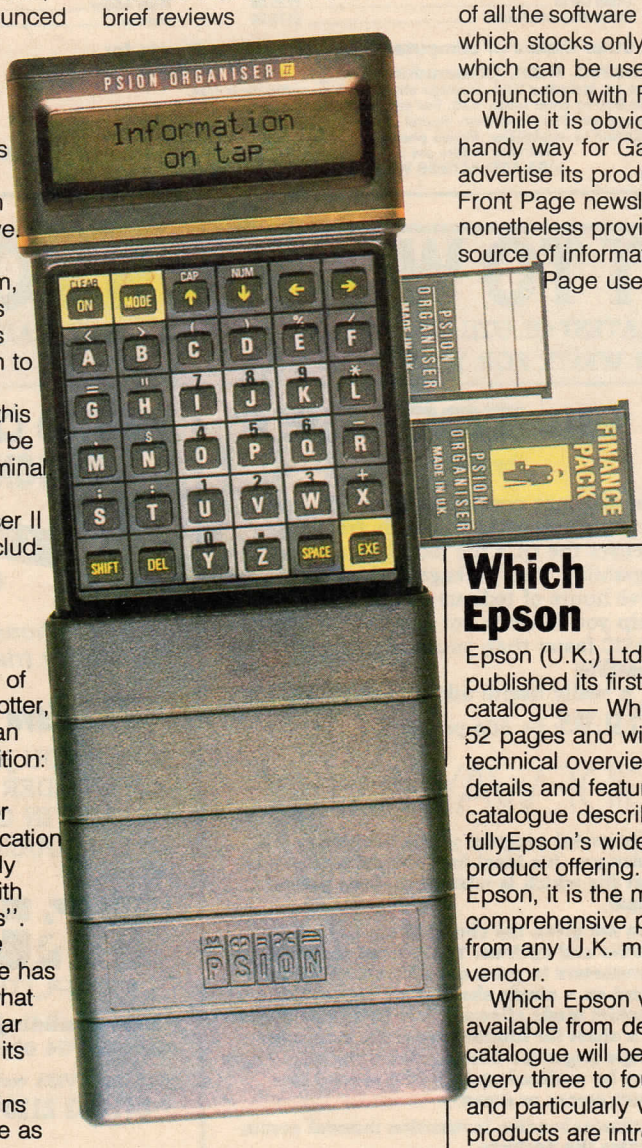
The Organiser II uses a programming language called OPL which is very similar to Archive. Two companies, Eidersoft and Transform, produce comunications software which enables Organiser II information to be downloaded to the QL and vice versa. In this way the Organiser can be used as a portable terminal.

Psion credits the success of the Organiser II to its many features including a built-in diary, calendar, multiple alarms and its programmability. Chairman and founder of the company, David Potter, said of the the American and Japanese competition: "They either cost thousands of dollars for the same level of application utility, or they are purely consumer machines with very limited capabilities".

Using its *Front Page* program, Gap Software has produced the first of what promises to be a regular newsletter for users of its software.

The first issue contains news about Front Page as well as more general information about the QL software scene. There are brief reviews of all the software sold by Gap, which stocks only products which can be used in conjunction with Front Page.

While it is obviously a handy way for Gap to advertise its products, the Front Page newsletter nonetheless provides a useful source of information for Front Page users.



Which Epson

Epson (U.K.) Ltd has published its first-ever range catalogue — Which Epson. At 52 pages and with its mix of technical overviews, product details and features, the catalogue describes fullyEpson's widest ever product offering. According to Epson, it is the most comprehensive product guide from any U.K. microsystems vendor.

Which Epson will be freely available from dealers. The catalogue will be updated every three to four months and particularly when new products are introduced to the Epson range.

Brother launch printers

Two new advanced printers will be launched by Brother at the Scottish Computer Show — a dot matrix and a daisywheel both the fastest in their range.

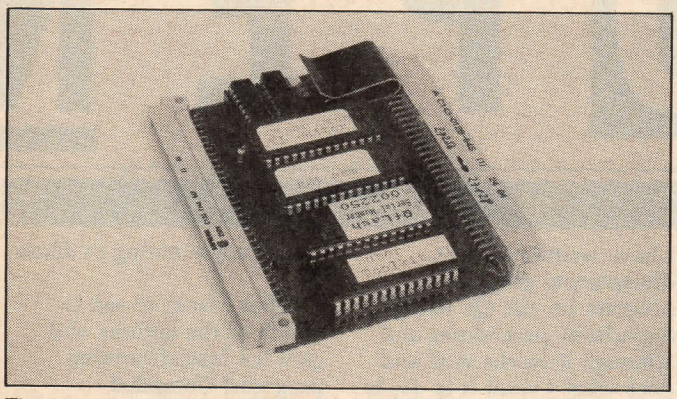
The 4018 is the first 18-pin dot matrix printer in the Brother range and operates at a speed of 480 characters per second — 115 lines per minute — and 100 cps in near letter quality. It is believed to be the fastest dot matrix printer on the market using just one head and has the added advantage of a bottom paper feed as well as top feed. A straight paper feed path makes it ideal for applications such as production of hotel bills and airline tickets. The printer is also capable of printing in colour using an upgrade kit and also features a standard 48K input buffer.

The latest in its highly-popular HR range of printers, the HR-40 is a streamlined machine offering a print speed of 40 characters per second, plus a built-in tractor feed and sheet feeder which are normally expensive options.

Also on display will be the 1709 — a new, wide carriage (136 cols), dot matrix printer which operates at 240 characters per second and has a near letter quality facility of 50cps. With a memory of 24KB and an operation noise level of only 55 decibels it is the top of a highly-successful series which includes the 1109, 1409 and 1509 models.

For further information on Brother printers contact: Brother Computer Peripheral Division, Shepley Street, Guide Bridge, Audenshaw, Manchester M34 5JD. Tel: 061 330 6531.

Chip Board



The horizons for the Q Flash *Chipboard,* marketed in the U.K. exclusively by TK Computerware, are expanding continually. Developed initially to eliminate the octopus problem of sticking pieces to the outside of the QL, the possibilities of allowing users to dedicate their QLs for particular applications is providing excitement in a number of software houses.

Utilising the two 128K expansion slots in the QL memory map at $C000 to $FFFFF hex 786432 to 1048575 dec, users can incorporate software selection of Chipboard EPROMS with up to 256K, without disc drives, or 128K if a system is fitted with discs.

TK Computerware is offering a range of EPROM which have previously been more at home protruding from the back of the QL for use with the Chipboard system. Discussion with many of the major software houses is under way for the supply of popular programs on EPROM rather than some form of magnetic media such as disc or cartridge.

If, and when agreement is reached by the parties concerned, users will, by inputting an initialising keyword, be able to have a an optionally-dedicated QL, whether for desk-top publishing, graphics or a host of other uses, readily to hand.

Colour re-inking

Nick Godwin tells us that his Scottish-based mail order fabric ribbon re-inking service Aladdink can now undertake colour re-inking. Hitherto only black was available. Colours available are blue, brown, red, green and purple, but others may be available on request. Even gold can be arranged.

While Aladdink cannot change the colour of your ribbon, Godwin says: "If you supply us with a used coloured cassette, we can re-ink it".

He is also able to put customers who want to change to colour in touch with a supplier of ribbons suitable for most makes of printer — just telephone him or write enclosing a stamped addressed envelope.

Nick Godwin, Aladdink, 4 Hurkur Crescent, Eyemouth, Berwickshire, Scotland, TD14 5AP. 'Tel: 08907 50965 (10am-10pm).

Pyramide disc drive system

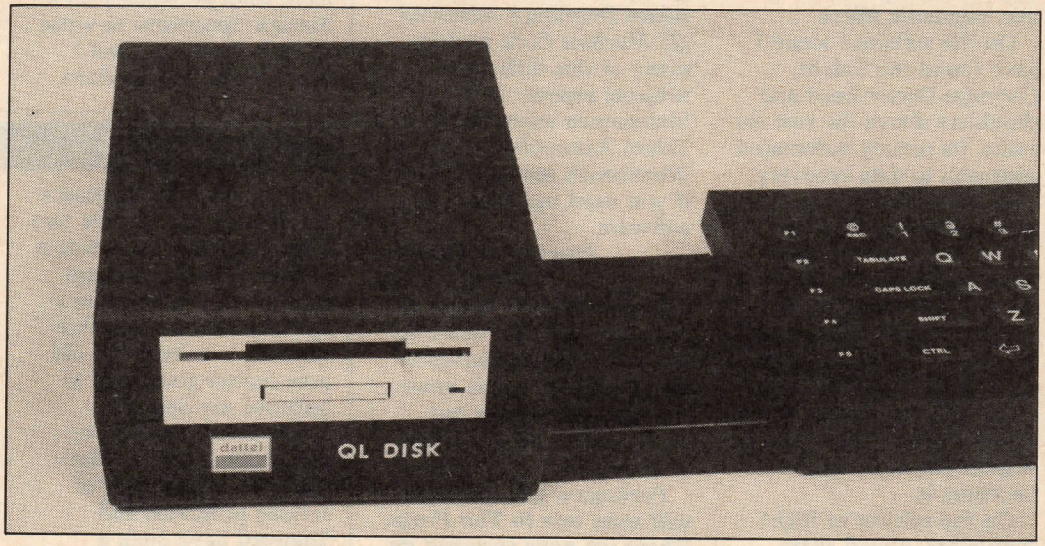
To an ever-increasing range of products, Pyramide has acquired sole rights to the disc drive system intended originally for release by the now-defunct French company Direco.

Supplied as a complete and very economical single drive system, *QL Disk* includes its own interface, toolkit and separate 12V power supply; the unit connects as an in-line assembly to the QL at the expansion port.

Provision for expanding a single drive to twin discs is built-in, requiring a single ribbon cable connected at the rear of each drive and stacking the units together. A 500K unformatted system, QL Disk provides users with 360KB of disc storage media in 40-track, double-sided format on standard 3½in discs.

Memory expansion is not built into the interface. Users wishing to add extra RAM to their systems can take advantage of the economical 512K internal upgrades provided by Rainbow Digital Repairs, Sector Software and a number of other main QL suppliers.

Data stored on QL Disk-produced media can be read by the higher density 1MB drives; the reverse, however, is not true. Users wishing to exchange discs with others can, however, format a disc in their QL Disk and the higher-density drives will write to the 360K formatted media.



Toolkit options include bi-lingual language prompts — the preview version supplied defaulted to the French. Prompt selection may be made, after pressing (F1) or (F2), by inputting "ENGLISH" or adding an equivalent line to BOOT programs.

Toolkit commands are extensive and, while not in the more conventional Tebby/ Qjump structure, nonetheless include similar commands, as well as a number of useful commands exceptional to the QL Disk system.

Catalogue commands include the conventional DIR as well as CAT. The latter command details file statistics such as name, size and last date it was saved.

The range of COPY commands include DUPLIC, which copies a single file and date-stamps it from one device to another and BKP, which copies a whole medium from one device to another. Other commands allow the user to copy from mdv to disc, changing file occurrences of "mdvn" to a disc drive call automatically, either drive one to drive one occurrences or all mdv occurrences to disc drive only.

In addition to the conventional SAVE, SEXEC and OPEN commands, users can over-write existing files with either SAVE-OVER, SBYTES-OVER or OPEN-OVER.

Other file-handling routines include RENAME and SEARCH; a complete range of multi-tasking environment commands for job control; binary and hex number conversion utilities.

Users wishing to avail themselves of the many advantages of a disc-based system can now do so at a very economical price.

OPEN

Open Channel is where you have the opportunity to voice your opinions in *Sinclair QL World*. Whether you want to ask for help with a technical problem, provide somebody with the answer, or just sound off about something which bothers you, write to: Open Channel, Sinclair QL, Petty France, London SW1H 9ED.

Grounded

Owning a QL for two years, I have encountered many of the frustrations — non-existent Sinclair customer support — and the elations — good readers' program — about which other users write.

Having watched a graphic simulation recently on Microlive of the reasons why pseudo 32-bit micros fail to live up to the makers' promise, I now realise why Quill is so slow. The QL was singled out by name as being particularly let down by its 32-bit architecture being linked to an 8-bit data bus.

In spite of its limitations, I respect the capabilities of this enigmatic micro.

On the software scene I have found the Talent, *Cartridge Doctor* head and shoulders above the rest for value, its mainly automated approach to data recovery being particularly welcomed by a novice like myself.

I concur with the reader from Leuchars who derated the one and only *Flight Simulator* as being beneath the dignity of QL, in spite of near rave reviews in this magazine. The reviewer obviously was not a pilot as I suspect the man from Leuchars is.

On the subject of flight simulators, would some enterprising software house produce a product worthy of the QL — at least to the standard of those available for the Spectrum/Amstrad. The rewards for such a product would undoubtedly be great.

I have found Rob Sherratt's file-copying routines, obtained from Microdrive Exchange, brilliant, particularly the extremely professional printer driver, although Paolo Baccanello's file-handling utilities program given free with *QL User* in February 1985 takes some beating. *QL World* would do well to feature this program again for the benefit of new readers, if only to save them buying one of the inferior commercial offerings.

Starport from Karl Jeffery gives welcome light relief from my increasing use of the QL. For business, with Tony Quinn's *Q-CAD*, also obtained through the Exchange, finding increasing favour for that quick doodle to impress my boss.

Many new readers ask about good books to introduce them to various aspects of programming the QL. For Super-Basic Ian Sinclair's *QL Computing* is one of the best. For machine code starters, *Machine code programming on the Sinclair QL* by Martin Gandoff and Adam Denning's *Advanced QL Machine Code* explain many of this difficult subjects aspects. The Metacomco assembly kit and Talent Assembler Workbench are my choices if you need machine coding software.

Hughie McGovern,
Bolton, Lancs.

Editor's reply: It is a sad, but true fact that there is no decent flight simulator for the QL. What is more, software houses do not seem keen to take up the challenge.

Perhaps a QL aeronaut will send one to The Progs. Those we have received do not quite make the grade. We live in hope.

A need for speed

I have written a three-dimensional graphics program for the QL using SuperBasic procedures and although it works well and does what I want it to do, it is very slow in execution. To speed it, I have been thinking about changing it into machine code but I do not know assembly language programming and I do not have time to learn it from scratch. I have therefore been looking at compiled code and there seem to be three possibilities:

Use a SuperBasic compiler, e.g., Supercharge or Liberator; re-write the program in Forth, which I have used previously on a Sinclair Spectrum; re-write in Pascal, which I feel I could learn, having done some programming in *dBase III*.

What I want to ask is which of the options will give the fastest-running program? Compiled SuperBasic would be the simplest option but would it be as fast as one of the other languages? Many of the calculations required involve using sines and cosines and would need to be done in floating point arithmetic.

T. Ashcroft,
Newcastle upon Tyne.

Editor's reply: When you take into account the time you will have to spend re-writing the program, the quickest and simplest option would probably be Turbo — see the review on page 16 which gives some speed comparisons.

Reader's recommendation

I suffer from Huntington's Chorea and for the last two years I have been getting a great deal of satisfaction from using my children's Spectrum with a sensible keyboard, to keep the old grey matter going and to improve my dexterity.

My illness causes pre-senile dementia and the 'shakes', so a variety of serious programs and Tasword have been a blessing to me, although I have long hankered after a QL.

I was lucky enough to be able to buy one at a price I could afford, mainly because there was no manual or Psion package. Much time and telephone money was expended on trying to locate the missing essentials.

Steve, the owner of Nimbus Computing at Park Langley, near West Wickham, Kent, had a spare set and sold them to me at a very reasonable price.

Colin, of Transform, Beckenham was able to supply me with a suitable printer lead interface and spent ages photocopying a printer manual to make it easier to understand the setting-up.

Both firms were very helpful and offered to provide any further assistance I might require either by visiting me or by telephone. It was a delight to find a QL and two such companies all in a few days and I recommend all three to your readers.

John Eldridge,
London SE16.

Quest for support

About a year ago I bought the Quest/Sinclair QL *Cash Trader* package, which users will know requires using the Boot Master cartridge each time for security verification. All was satisfactory until recently, when the Boot Master became faulty, so I returned it to the Trader Support Club at Camberley, as specified in the manual.

Six weeks and no contact later, I discovered that Quest have been taken over —but excluding any Sinclair-related products — and that my cartridge is probably festering in some long-untended letterbox.

Meanwhile, I am stuck with £70 worth of unusable accounts program, not to mention all the data I have put in and now cannot access.

D. P. Mackenzie Smith,
Bristol.

Editor's reply: Next month's business feature will have full advice for Cash Trader users.

CHANNEL

Constructive

You have most likely been told enough times by now about the error in page layout of the Progs in the December issue. I therefore will not say more about that. Instead, I would like to mention that your comment on the *Multimaze* program is non-constructive in criticising the fact that on viewing the maze one was returned to a new maze, thus defeating the object of viewing the maze.

Constructive thinking would have told the reader to alter the program with the idea of publishing the best improvements to the program in the way of user-friendliness, graphics and any likely bug correction. In that way you fill white-space with possible improvements of past-published programs instead of complaints about a program crashing on line so and so.

As an example, here is one idea on altering the Multimaze program:

Delete lines: 290; 300; 1240; 4280; and 4290.

Insert lines:

```
1025 INK # 0,4: AT # 0,2,5: PRINT # 0,"Press 'T' to view the maze": INK # 0,7
1231 AT # 0,2,5: PRINT # 0,"                ":REMARK 32 spaces
1232 INK # 0,2:AT # 0,2,10: PRINT # 0,"OW!": INK # 0,6: PRINT AT # 0,2,14: PRINT # 0,"That hurt!":BEEP 6000,1:PAUSE 50
1233 AT # 0,2,10: PRINT # 0,"                ":REMARK 16 spaces
1255 INK # 0,4:AT # 0,2,5: PRINT # 0,"Press 'T' to view the maze": INK # 0,7
4271 AT # 0,2,2: PRINT # 0,"Press 'r' to return to maze"
4272 AT # 0,3,2: PRINT # 0,"Press 'n' for a new maze"
4273 z$ = INKEYS(-1)
4274 IF z$ = = 'r':CLS # 0: INK # 0,6: UNDER # 0,1:FLASH # 0,1:AT # 0,2,15: PRINT # 0,"CHEAT":BEEP 10000,25:PAUSE 100: FLASH # 0,0: UNDER # 0,0: INK # 0,7: CLS # 0: GO TO 1025
4275 IF z$ = = 'n': CLS # 0:GO TO 110
4276 ELSE GO TO 4273
```

Alter lines: 160; 170; 230; 290 to 160 inp$ = INKEYS(-1):IF inp$ = = 'F' THEN CLS:STOP

```
170 IF inp$ < > 'd' AND inp$ < > 'D' AND inp$ < > 'P' AND inp$ < > 'p' THEN GO TO 160
230 IF inp$ = = 'p' THEN
290 PRINT "the whole maze."
```

Lines 160, 170 and 230 handle possible bugs, i.e., Capslock on/off.

Now the complaint. In *Bomber* by D Marsh I crash out on line 850, i.e., CALL do-graph x%,y%,s%,c-tab

I have checked lines 460 to 610 reference DATA statements and parameters. Please explain where I have gone wrong.

D. Brawn,
Brighton.

Quirky Sinclair

I find it difficult to take Sir Clive Sinclair seriously. Sinclair through the years produced the class D amplifier, which did not work; the black watch, which I believe did not work; the pocket calculator, which worked to some extent; and then his successful computers, the ZX-81 and the Spectrum, which worked, provided you were prepared to tolerate such quirks as RAM pack wobble and mushy keys.

Now he criticises his engineers for incorporating the 68008 processor into the QL, saying that the customer would have been satisfield with yet another Z-80 machine. I can scarcely believe that. I am not a hacker but I would never have bought a Z-80-based QL. I would probably have turned to a PC clone instead.

The relative failure of the QL has had nothing to do in my opinion with the processor but with the failure to produce properly-working machines in time and then not to support them with hardware expansions and better software.

That was left to outside suppliers, who have done a good job. If from the outset the QL had been immediately available with memory expansions and disc drives as options, I think it would have then attracted favourable reviews. The press was very hard on the machine. Mine has worked well and did all the work I expected of it. I am now replacing it with a Thor but I shall keep it to work on the Thor network as needed.

Frank Gutteridge,
Geneva,
Switzerland.

Software for scientists

I am the owner of a 640K JS ROM QL with Tony Tebby's EPROM Toolkit added. I am a student studying chemical engineering in London and much of my work involves the writing of essays and project reports, which I do using Quill, occasionally using Easel for scientific graphs.

I find this serves me very well except in one major area. By nature, the reports involve a large number of both mathematical symbols and the Greek alphabet and I am having extreme difficulty finding a suitable way to incorporate them into both Quill and my printer, a Canon 1080A.

I realise that I could write a large program which would enable me to use the codes generated by CONTROL+KEY to produce the desired character on the screen within Quill, and translate it into either a graphics or user-defined character to be printed. That would involve a large amount of time and computing knowlege which I do not have. Also, for that matter, the Translate options within INSTALL_BAS are of no use to me as I know of no way to extend the number of translatable characters beyond 10, which is not sufficient to cover the characters, more than 50 of them, I have in mind.

In trying to solve this problem I have collected several programs which do part of the job i.e., allow entire graphic fonts to be defined for the printer, re-definition of the high typeface Quill characters — but none of them does exactly what I require and to alter them to suit my need would require a large amount of program re-structuring.

I would be grateful if you could help me in any way with this problem. Has anyone written such a package or packages to modify Quill for scientific use, or can anyone suggest ways in which such a program might be constructed?

C. Keener,
London W6.

Editor's reply: Two packages which may be of use to you are Tasman Software's* Tasprint *and* Inkwell *by Palantir.

Care Electronics is working on software which sounds as though it may do the job. It works from within Quill and includes a mathematical character set.
Care Electronics. Tel. 0923 672102.
Tasman. Tel. 0532 438301.
Palantir Products, 60 St Lukes Road, Bedminster, Bristol.

Hallmark Software

Hallmark lets you enter the world's largest software library with a real CP M/ulator.

Now many thousands of different software programmes can be run — well over 10,000 — a lot of them business and a lot are free under Public Domain.

CP M/ulator runs any well-behaving CPM programme.
Z80 or 8080 machine code.
User friendly interface. Works with any QL Device (disks, Harddisks, Ramdisks etc.)
Easy to install in your System.
100% machine code — it doesn't RUN IT SPRINTS.
Terminal emulation allows use of full screen editors.

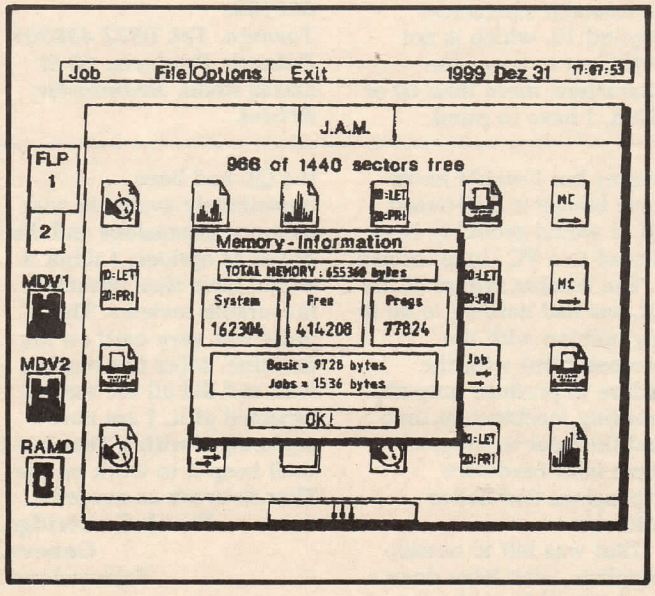
The CP M/ulator GIVES YOUR QL A NEW LEASE OF LIFE.
A whole new world of software has been opened to you.
Hallmark Software cares for your QL by giving you what you need.

J.A.M.

Job Application Manager

J.A.M. is a front end desk-top manager programme using an icon environment. J.A.M. has its own internal dynamic ramdisk which does not need to be formatted. J.A.M. has its own job scheduler, **you can multitask the PSION suite (Quill etc.) without any additional software.** Notepad and job controls are standard. Customise your own JAM to suit your needs. Mouse compatible. Features Icon environment, System Internal Dynamic Ramdisk, Desk-Top Functions, Job Manager, the Psion Suite can be multitasked without any additional software.

DM59.00 £19.95



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GRAPHICS CONSTRUCTION KIT

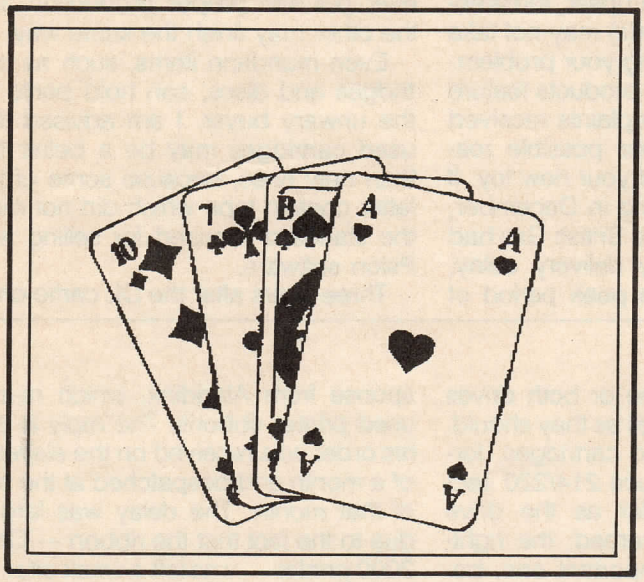
Now you can write your own customised graphics program in minutes, i.e. a package like EYE-Q (copyright Digital Precision) should be possible with about 8 KB of Basic, which can be compiled if necessary.

A set of Superbasic extensions that really allow you to design a program that suits your needs and not to suit your needs to the program. Comes with a free demonstration program and a comprehensive user handbook. DM49.90 £14.95

FULL HOUSE

Reviewed in QL World 11/86: ' . . . it is good fun to play, worryingly addictive . . . '

100%. Machine code. Superb colour graphics. You need nerves of steel to play. A fruit machine poker game completely identical to many machines found in German pubs. DM39.90 £12.95



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HARDWARE & SOFTWARE Belgium Luxemburg Netherlands	: **SIMSOFT, Guy Delforge, Jan Hamminecke Str. 39, Mariekerke, Bornem, Belgium. Tel: 052 335910**

TROUBLE

Framed as a general request to suppliers and producers to test their products more thoroughly before releasing them, the March *QL World* contained an article dealing with compatibility and quality troubles with QL software and hardware. This article is part of a new series dealing with letters received from readers making complaints about products and suppliers. I can almost see the hackles rising on some suppliers already, so I hasten to add that this is not to be a 'knocking' column.

First, a few points about the mechanism of this business. A little reading of the advertisements in *QL World* will indicate that many software titles are sold through several outlets; it is often obvious which is the original supplier. That supplier may well have only a loose connection with the program authors; programs usually are written by individuals who authorise suppliers to sell them and receive a fee on each copy sold. That arrangement causes two obvious possibilities for complaint. If the software is ordered from a supplier who, in turn, orders it from the originating supplier, there is a chance of one or other supplier being out of stock of the item. If you as a user do not receive what you ordered, you blame the supplier from which you ordered it but he may be getting bad service from his supplier.

The second point is similar; if there is a fault in the program, or it does not run properly with your system, you complain to your supplier; he may not know of the problem and has to go to his supplier, who then has to contact the author. It would be no surprise to find that he had long ago lost interest in the program, having moved to other things — possibly other computers. Much as you may be upset, threatening to sue the supplier(s) may not take you any closer to fixing your problem.

Delays in supply of products feature high on the list of complaints received but consider the other possible reasons for non-arrival of your new toy. If you ordered something in December, there is a good chance British Gas had a large hand in any delivery delay, because it chose the peak period of Christmas mail to float its shares. Orders sent from overseas can take weeks or months to arrive at their destination under normal circumstances and the despatched goods can take just as long to reach you. Did you put the correct post code on your letter? The Post Office gives priority to mail with the code.

Tread warily when considering buying a new product, because it may not exist. There is nothing like visiting a Microfair and asking for a demonstration of the advertised goods. I can think immediately of three hardware items which sounded ideal for me but were not working properly when advertised for sale. Nor were two of them ever put into proper production and the other may finish the same way.

Even mundane items, such as cartridges and discs, can hold perils for the unwary buyer. I am advised that used cartridges may be a better bet than new ones, because some of the latter contain tape which did not meet the standard required for selling with Psion software.

Three years after the QL came on to

J. McGreehin asked where he can obtain 215mm-wide paper for the Serial 8056 printer as sold by Dixons, because he finds the 210mm-wide type sold by Boots to be unsatisfactory. The reply from Dixons Customer Service is that the complaint had not been received previously and it believes the 210mm paper to be the correct type to use.

It has sold thousands of the printers and is continuing to supply the 210mm paper. It may be that McGreehin has a problem with the printer; if other readers have experienced the same difficulty we would be interested to hear about it in more detail.

The same reader asked if others had any problems formatting new Microdrive cartridges. He bought two four-packs and found four cartridges would not format and two more would give only 215 sectors. As with the QL, there must be old cartridges around, perhaps unused but not up to later production standards.

It is unlikely that a complete pack would be so bad as not to be formattable at all. Even if existing cartridges format and are usable, there must be the suspicion that one or both drives are not working as well as they should. With good drives and cartridges, formatting should produce 214/220 sectors or better. So far as the drive performance is concerned, the right-hand figure is the important one, because that is the total number of sectors found on the cartridge, whereas the left-hand figure is the number of sectors which are good, i.e., usuable for data.

I have just seen 227/229, formatting a cartridge bought with a Psion program already on it, but that is the highest figure I have had; 218/220 is a reasonable minimum to expect from good drives and cartridges. If most cartridges give less than that, the drives need tweaking; the drive rollers can be cleaned with a non-aggressive cleaner, such as methylated spirit and re-fitted the other way up, then pushed down until the clearance from the plastic collar below is about 10-thousandths of an inch.

R. Handford wrote about slow response from Aladdink, which re-inks used printer ribbons. The reply is that his order was received on the eleventh of a month and despatched at the end of that month. The delay was largely due to the fact that the ribbon — DMP 2000 printer — was left a week after re-inking to ensure that the ink penetrated fully; that is not necessarily required with other types of ribbon. Aladdink asks that any customer experiencing delay makes direct contact, preferably by telephone but not after 10pm.

I. J. Bottomley needs a copy of the disc drive operating system for Quest Executive Series drives. Unfortunately, we can offer no advice other than to join Quanta and ask for help. Quest did not answer our request for information but we received a reply from IT Marketing Ltd, which apparently bought the Quest Business Software division. It advises that it cannot provide help with any QL-related difficulties, other than to offer 50 per cent discount to buyers of QL Cash Trader who are upgrading to the IBM or Amstrad version.

SHOOTER

the scene we still see letters asking about service from Sinclair. While Sinclair may be returning to the computer market, it has not accepted responsibility for the QL since selling the rights to Amstrad last year, and there is no point in trying to contact the Sinclair address given on guarantee cards, which should have been taken out of the packages months ago.

The dealer who sold you the machine should deal with service; if he is no longer in business, or you bought by mail order, contact the company noted below. It handles in-guarantee service on some QLs and also has a fixed charge of £39.95 including VAT and P&P for out-of-guarantee repairs.

Likewise with Psion Software; although it is still involved in the computer business, it is unlikely it will want to deal with queries on the QL quartet. Eidersoft has spoken of providing support for Psion programs but only if you join its Support Scheme. Reading through back numbers of *QL User/World* and *Quanta* is as good a source of help as any on this subject.

Many QLs bought in the last year or two will not have been new. They will have been returned as faulty by a previous owner and then refurbished.

There were two QLs in a shop near to me in late February marked "D06" and "D13"; the hardware modification level reached at least D17 before production ceased, so those two machines cannot be new; in any case they are in plain brown boxes, not the original Sinclair ones. I think both machines were manufactured prior to early 1985.

Checking whether or not they have been updated would be an uncertain business; there should be a sticker underneath giving the modified hardware level, e.g., just "D14" and typing-in <PRINT VER$> and pressing Enter should give the message "JM" or "JS" on the screen. Any other message e.g., "AH" or "FB" would be unacceptable, as that would indicate the operating system/SuperBasic in the machine was a version with significant problems.

Formatting a good cartridge should produce 214/220 sectors or better in both drives; much less would suggest the drives are not modified to later standards.

When a new program fails to run on your machine, do not think automatically you have bought a dud. There are many combinations of hardware and software of which one can think with the QL and they do not all welcome new programs. Failure of a program to be read from a Microdrive usually means a bad drive or cartridge and you should be aware whether or not your drives are working properly.

It is possible for a cartridge to read on one drive and not on another; you cannot say in that case that the cartridge is bad but it may still be necessary for you to request a replacement. Try getting a directory of the cartridge from the other drive — the one not used to run the program — and then try to Copy one of its files to the screen; if both work the program drive is not at its best, even though it will read other programs.

One final point before answering some letters. Bear in mind the time delays in posting; your order to a supplier may take a week or so to arrive.

That is rather a sad story but not unusual, remember the Quest advertising about two years ago? The disc drives proved to be very big, very expensive and presumably not too convenient to use with the operating system on cartridge. If any reader can supply a copy of the necessary files, write to us and we will pass the letter to Bottomley.

Another reader raised a problem which he indicated could be widespread — software not being in the package bought. In this case, the supplier had taken considerable trouble to send the missing item but had been handicapped by not being able to contact the company from which he had bought the package. Lack of response to telephone calls is something with which most of us are likely to be familiar but we may not be aware people in the trade suffer the same treatment. To circumvent this problem, the only policy is to keep large stocks, which is an expensive proposition.

It is worth bearing in mind that the cost of QL software is low compared to that for office computers, even though the features may be comparable, and a one-man business supplying software bought from another supplier stands to lose money if he has to spend large amounts of time and petrol chasing missing items. That is not to say it is not his responsibility to ensure the product sold is of merchantable quality, though like it or not, it is his problem if something is missing from orders he despatches.

The last point led to another, that of defective goods. The return rate for software seems to vary from less than one percent to more like 30 percent and the same applies to some hardware.

Sinclair set a very bad standard from the start. Although I read that the return rate was less than five percent, I would think it was more likely to have been 25 percent. Would anybody, like to hazard a guess at to how many of the QLs sold during the last year were new in the full sense?

Such a rate of faults is much too high; even one percent is not good. That is more true with software, since duplicating programs is not a complicated process leaving aside the separate and all-too-frequent incidence of bugs in programs.

Service:
Verran Micro Maintenance
Unit 2h & 2j
Albany Park Industrial Estate
Frimley Road
Frimley
Surrey GU15 2PL.
Tel: 0276 66266

Quanta (users' group):
Brian Pain
24 Oxford Street
Stony Stratford
Milton Keynes MK11 1JU.
Tel: 0908 564271

Cash trader:
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TOUCH TYPIST

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THIS IS WHAT *QL WORLD* HAD TO SAY ABOUT THE PROGRAM

"Succeeding admirably as a serious course intended for beginners and experienced typists alike, Touch Typist is a well presented useful utility which includes the professional polish of good quality software"—*QL WORLD*, July 1986.

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ZX8302 ULA.....£13.00
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SOFTWARE

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EYEQ.....£29.00
ARCHIVER.....£17.00
TURBO.....£84.00
THE EDITOR (DP).....£25.00
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QLIBERATOR.....£70.00
FORTH.....£34.00
MAILMERGE.....£10.00
DECISION MAKER.....£30.00
GARDNER.....£20.00
TOOLKIT 2 (EPROM).....£34.00

TECHNIQL.....£49.00
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T·U·R·B·O takes the lead.

The Digital Precision team has been labouring long and hard in the pits to produce Turbo, a compiler which looks set to take all the prizes for speed. James Lucy is the man in pole position.

After a long wait *Turbo* from Digital Precision has finally arrived. Turbo is a compiler which transforms a slow-running, slow-loading SuperBasic program into fast machine code. You have seen it before with *Supercharge,* you have seen an alternative approach with *Q_Liberator,* and now Turbo has entered the market with a host of claimed advantages but at a cost which approaches the current new price of the QL. The price of £85 means that for most people it cannot be a casual purchase and you will need a serious reason for buying it.

Turbo is on two Microdrive cartridges or a single disc and is accompanied by an enormous manual. Among the many files are two back-up programs and the first step is to copy everything to spare cartridges or discs. It is a simple process because the program is not copy-protected, although potential pirates should know that their identity is coded into the program.

The crash course — not a prophetic term, it is hoped — in the first chapter of the manual shows you how to get started as quickly as possible; very soon the supplied demonstration program graphics or prime numbers, so familiar to Supercharge owners, will be filling the screen but many questions about the many options on the Turbo front-panel will remain unanswered.

Turbo operates on the currently-loaded Basic program. Typing 'Charge', one of the Super Basic extensions provided by the Turbo Toolkit, loads and runs the first phase of the compiler, the parser. The Turbo front panel will appear, showing a set of default things as the faults for such code to be filename of the destination produced and the for the listing.

Each default may be changed, if required, and lasting changes can be made using a supplied configuring program. If all is well through the two passes over the program made by the parser, the second, code-generating, phase will run automatically, multi-tasking with SuperBasic while completing the compilation.

Hot key

The process is rapid and can be made even faster if sufficient RAM is available to make Turbo resident; in this mode Turbo is ready for use by pressing a hot-key combination of your choice.

Supercharge users who enjoyed the challenge of trying to write programs which made pretty patterns out of the screen memory during compilation will find that pleasure denied them, since Turbo uses buffer RAM and, if limited RAM is available, a temporary file for working storage.

The Turbo front panel deserves a little more comment, because it is one of the means by which the user interacts with Turbo, the other being by compiler commands embedded in the program being compiled, and because it is a neat solution to the problem of obtaining a good deal of information from the user without asking a repetitive sequence of questions.

It is described in the manual as a 'finite-state automaton' which, in practice, seems to mean that your route round the panel using the cursor keys is defined, and that questions which do not apply because of selections made elsewhere need not and cannot be answered. Whatever name Freddy Vaccha, the Digital Precision answer to Philippe Kahn of Borland, chooses to give it, the front panel is a vast improvement on Supercharge and in any case the Supercharge approach would have been inadequate with all the extra Turbo options.

Speed is fundamental in computing. All the cleverness of a computer arises from its ability to do trivially simple things very quickly, so it could be said that the faster it works the clever it is. SuperBasic is slow but it is a very high-level language with a great deal going on behind the scenes; much can be made to happen with just a few program lines.

The merit of a SuperBasic compiler must be measured with strong emphasis on its ability to maximise the speed of execution of the compiled program, providing that severe restrictions are not placed on the content of the source

SuperBasic and that the compilation process is not unreasonably slow.

Turbo is the fastest SuperBasic compiler so far, both in terms of its speed of compilation and in the speed of the compiled code produced. When you consider that Turbo has been used to compile itself, it is interesting to reflect on the effect of improved object code execution speed on the compilation time; think on it if you have several hours to spare and plenty of stack space.

While any delay is longer than desirable, Turbo compilation time is impressively shorter; the parser seems almost as fast as the tokenisation process carried-out by the interpreter when loading a Basic program from storage and the code generator invariably runs faster than the parser.

Despite the fact that Turbo was running in slower internal memory, a 60-line program was compiled in less than 30 seconds and a 600-line program took less than four minutes. The precise timings depend on the type of optimisation chosen for the compilation, whether Turbo is resident or must be loaded from Microdrive, and the speed of the destination report device — using a RAM disc is best. All types of high-level language compilers take their time and, considering that SuperBasic was not designed with compilation in mind, the performance of Turbo is commendable.

Fine tuning

In keeping with the comments about speed in the compiled code, Digital Precision has taken the problem by the throat and given it a good shake. The biggest section of the manual — 25 pages — is devoted to tuning Turbo for top performance. A number of optimisations are provided, the simplest being to select the 'speed' option on the front panel to generate fast, in-line code for the entire program. That can have dire consequences for program size, however, and is intended only for very short programs.

In the majority of cases just a few lines of a program, often nested loops, consume most of the running time and it is those which should be rendered in in-line code. That is possible using the 'rem' option on the front panel and, with judicious placement of the REM + and REM – compiler directives, in the SuperBasic program. A utility included with Turbo Toolkit allows programs to be analysed for bottle-necks and other candidate areas for in-line code.

Integer arithmetic is slower than floating point under the interpreter and integer control variables for loops cannot even be slipped past the SuperBasic syntax checker except on pre-JM ROMs. That problem is solved by a toolkit command IMPLICIT%, which tells Turbo to treat specified variables as integers, even though their names do not end in the % sign.

Dramatic

In that way Turbo can generate much faster code for integer operations and loops and yet the program remains acceptable to the interpreter. Where integer loop control variables are also being used to index into arrays the speed increase can be dramatic, as demonstrated by the *Sieve of Eratosthenes* program shown in the table.

Considerable improvements in string-handling are claimed over both the interpreter and Supercharge and the amount of run-time checking which goes on is in some cases reduced in comparison to Supercharge. All this leads to major increases in speed although, as always, there is difficulty in obtaining true comparisons. Benchmarks, which are typically very short, fail to reflect the very significant benefits for large programs, but large programs which perhaps spend a good deal of time wandering round the ROM floating point routines or writing to the screen may also be unrepresentative.

Make of the comparison table what you will, although it should be said that bigger programs usually go down in size rather than the increase shown in the table. Perhaps the proof of the performance pudding may be found in Chas Dillon's *Editor* program, also published by Digital Precision. Editor is particularly fast, despite being written in Turbocharged SuperBasic rather than some other language — C for instance — which might be thought more appropriate for coding a text editor.

Owners of unexpanded machines may find problems with one of the design decisions — the parser occupies approximately 60K and must be loaded alongside the program to be compiled, limiting that to about 22K loaded; larger programs may be compiled in separate portions consisting of groups of procedures using the supplied utility Make_Modules but this is rather tedious — extra RAM is highly desirable. Q_Liberator is much more convenient in this respect.

Bench mark tests	Compilation time(s)	Running time(s)	Code Size
1. Recursive, string handling			
Turbo	28	20	9,150
Supercharge	35	30	10,200
Q_Liberator	35	31	8,166
SuperBasic	—	83	1,465
2. Composer — see Microdrive Exchange			
Turbo	201	27[2]	34K
SuperCharge	—	—	—
Q_Liberator	405	33[2]	33K
SuperBasic	—	61[2]	25K
3. Sieve of Eratosthenes			
Turbo	8	9[1]	6,928
SuperCharge	18	24	7,600
Q_Liberator	19	30	8,790
SuperBasic	—	154	321

Notes. 1. Where possible, Q_Liberator and Supercharge compiled the same program. The Turbo IMPLICIT % feature was used for integer FOR . . . END FOR loops.
2. Running time for Composer is time to load and display 100 notes.
3. Compilation times include loading Compiler overlays from 3½in. disc.
4. All compilation and running on 640K QL with slow internal RAM.
5. SuperBasic program size refers to file size. Compiled program sizes do not include dataspace.
6. Important. The figures in the table are accurate but cannot begin to cover all possibilities. Programs written with compilation in mind can display much greater running speed improvements.

The so-called help facility, obtained by pressing F1 in the front panel, is so limited it seems a waste of time to poll the key; ideally pressing F1 should bring up help on the currently-highlighted control on the front panel.

Turbo contains a number of features which allow the advanced user to avoid many of the restrictions of SuperBasic. The advantages of Implicit% in creating integer FOR loops have already been mentioned and Implicit$ fixes the curious SuperBasic shortcoming of being unable to SELECT ON a string. So-called rubber arrays allow existing arrays to be re-dimensioned larger or smaller while retaining as much data in the array as will fit, and sample SuperBasic routines are provided to implement virtual arrays. They exist on Microdrive or disc rather than in memory, although spare memory is used for buffering to reduce drive access.

Error-trapping, vital to the professional software developer, is implemented in full regardless of the QL ROM version in use and includes such features as Retry Here. The snag, as with several of the advanced facilities, is that they cannot properly be tested in interpreted code.

. Now for the really mind-bending bit. Turbo has a link-loader which can connect separately-compiled modules, provided that global and external variable, procedure and function names — and other data — are declared at the time of compilation. That means that tasks can share procedures and functions and can even use the same variables, although multitasking is suspended temporarily when writing to variables, for obvious reasons.

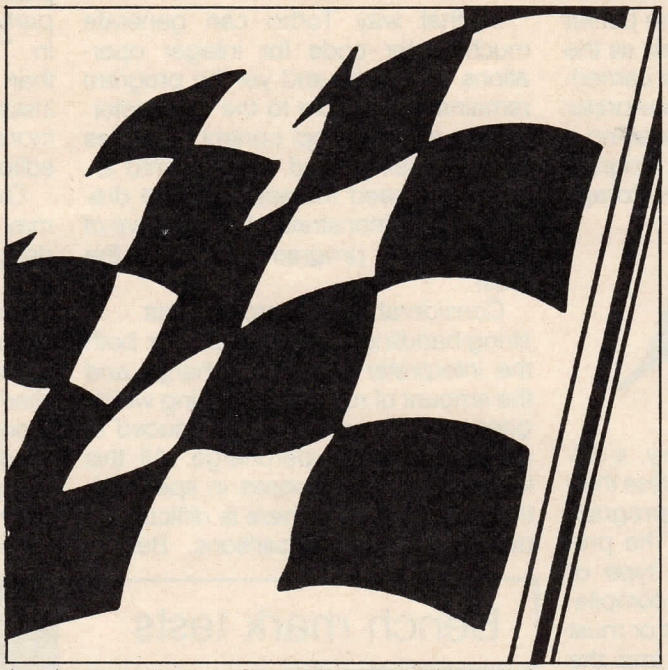
Tasks may also communicate via pipes and so a complex 'net' of jobs may be set up; that should provide food for thought. In case you are wondering, modules are not in Sinclair Relocatable Object File Format so you can forget about links to C, Pascal *et al.*

Fast load

Finally on speed, compiled programs load very muich faster than their interpreted counterparts; in the case of the *Composer* program mentioned in the table the machine code loads some 20 times faster, despite the code size showing an increase on compilation rather than a decrease.

Digital Precision is firm in its claims of significant size reductions in the compiled code. That, of course, does not apply for small SuperBasic programs, because there is a significant run-time overhead and, as can be seen from the table, it does not apply for the program Composer, but if you are compiling most large SuperBasic programs the reduction will be worthwhile.

Two related optimisations for size are provided which, like Supercharge, use short 16-bit addressing for jumps, thus limiting code size to 64K. If other optimisations are in use, Turbo casts aside the Supercharge 64K limit by using 32-bit addressing. That means finished code could be many times larger than would fit in a fully-expanded QL.



One of the problems with Supercharge was its fussiness about program style. Turbo is much more tolerant and uses many of the ideas from the DP Better Basic 'expert system' to make automatic corrections to a program which is not to its taste. It is arguable whether all the interpreter features should be supported, warts and all, or whether a more pedantic view should be taken; Turbo's competitor Q_Liberator tends to the former view, Supercharge the latter, and Turbo is somewhere in between.

In practice, provided the real nasties are avoided, Turbo compiles most programs without many changes and is certainly a vast improvement on Supercharge, while still not being so tolerant as Q_Liberator. Turbo does not support computer line references or calculations in data but, as compensation, ON . . . GOSUB may be to a procedure name rather than a line number and a number of interpreter bugs are fixed.

For people obsessed with money and precision, like accountants, Turbo displays numbers to a maximum of nine digits of precision, rather than the seven offered by the interpreter.

Bug free

No bugs were noted in the course of the review, despite the fact that a preview copy of Turbo was in use. There will certainly be bugs, as there are in any program, but they did not manifest themselves when compiling and running reasonably straightforward programs.

DP calls the manual an encyclopedia — and with some justification. It is comprehensive and, most important, well-indexed so that any information can be found quickly, although in some cases it will be necessary to wade through a few words too many. Since the manual is so enormous and space-consuming and the on-screen help is so limited it would have been pleasant to have a quick reference or beginners' guide in the form of a pamphlet or card which could be kept beside the computer.

Having, one assumes, used up the world's supply of brilliant orange paper on previous epics, DP has turned to green for the encyclopedia which, in conjunction with daisywheel print, is mercifully legible and even matches the on-screen colour of the Turbo front panel.

Previously I may have damned some Digital Precision products with faint praise. Turbo, however, is an excellent program, one of the best available for the QL. It is a great advance on Supercharge, both for the tyro whose programming style perhaps leaves something be desired and for the expert who can utilise features like the link-loading and procedure sharing.

New era

The only competitor, Q_Liberator, is greatly-improved since the review in October, much faster than it was, with more features and yet still easy to use and more tolerant of poor code; it remains a worthy alternative to its more expensive but more capable rival.

In conjunction with some of the commands in Turbo Toolkit, a very worthwhile product, Turbo takes SuperBasic and the QL into a new era. We should start to see programs which are impossible in interpreted SuperBasic and unthinkable on any other small micro. There is life in the Queer Lump yet.

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DIY TOOLKIT

If you are ready to add the second command to your DIY Toolkit Marcus Jeffery has something special — a 3D graphics command.

We are adding a new graphics command to SuperBasic. SuperBasic graphics are sophisticated for a home micro but they are only two-dimensional. So, when you want to draw that three-dimensional bar chart, you are stuck. To solve the problem, this month's algorithm will add the commands:

LINE3D [channel,] x1,y1,z1 TO x2,y2,z2

which will plot a line from the co-ordinates (x1,y1,z1) to the point (x2,y2,z2) in three-dimensional space. The three-dimensional co-ordinate system we will use is shown in figure one, where '+Z' is into the screen and '−Z' is out of the screen.

Working in three dimensions can become complicated so, to make things a little simpler, we assume a fixed eye position. Further, we take the eye position as the origin. To form a perspective view, we need to define a "vanishing point", a theoretical point at which all diminishing parallel lines meet. If you were standing on the white lines in the middle of a straight road and you looked along the road towards the horizon, the vanishing point would be where the white line and the two road edges meet.

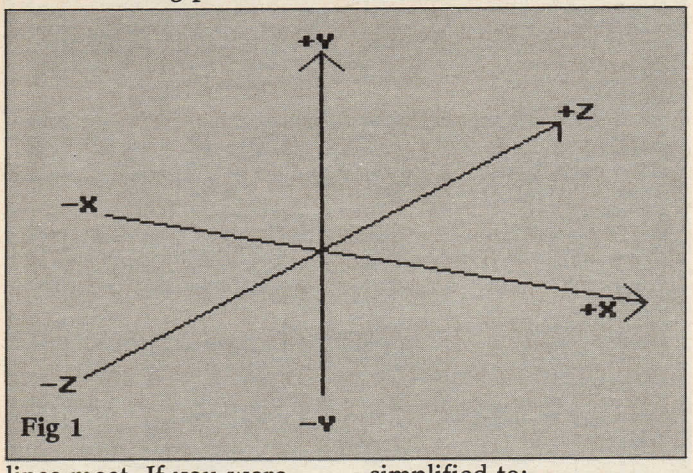


Fig 1

By taking this eye position, our perspective calculations can be simplified to:

x = X * D / Z

and: y = X * D / Z

where (X,Y,Z) are the three-dimensional co-ordinates, (x,y) are the co-ordinates to be plotted on the screen, and 'D' is the distance between the eye position and the picture plane — ie., the screen). Intuitively, the greater the value of 'Z' the further away the object and therefore the smaller the resultant 'x' and 'y' values. This implies that objects appear smaller at a distance. Figure two shows how this works for the Y-Axis; the X-Axis works in exactly the same way.

The problem now is to put all this into machine code. Figure three shows the Assembly Code listing. You will probably recognise the beginning which links the new command into the SuperBasic name table. Starting at the label LINE3D, the routine first checks to see if there is a channel number. It does so by checking the second byte of the entry for the first parameter. That will have been placed in the name table automatically by Qdos. For procedure and function parameters, the second byte of each name entry is coded in the following form:

Byte = h sss ttt

where: h — Set if parameter preceded by a hash '#'.

sss — Type of following separator:

0 = None
1 = Comma
2 = Semicolon
3 = Backslash
4 = Exclamation Mark
5 = 'TO'

ttt — Type of parameter:

0 = Null
1 = String
2 = Floating Point
3 = Integer

If the first parameter is preceded by a hash, it is fetched to the arithmetic stack as an integer using the $112 vector and the pointer to the start of the parameters in the name table — register A3 — is updated to point to the next item. Otherwise the default channel — number one — is used.

Having found the start of the channel entry in the channel table, the routine BETPARS is

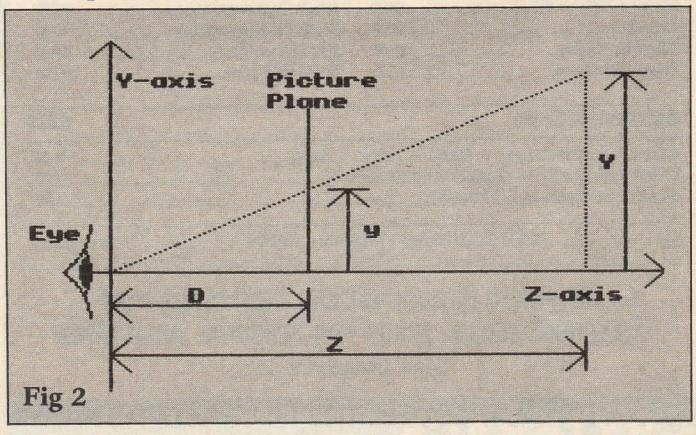


Fig 2

called to fetch the next three parameters. They should be (x1,y1,z1). They are then passed to the CALC3D routine to convert them into two-dimensional screen co-ordinates.

This routine uses a few arithmetic stack manipulations and the RI.EXEC vectored routine to perform floating point calculations. This is complex and it is suggested that you work through the routine one instruction at a time to see how it works. Remember that the stack grows downwards in memory, so the lowest address will be the Top Of the Stack (TOS) and the next address will be the Next On the Stack (NOS).

Three acronyms and Bottom of Stack (BOS) have been used in the routine. When first entered, the X, Y and Z co-ordinates will be in the stack, with X in the TOS position.

Having converted (x1,y1,z1) into (x,y) screen co-ordinates and placed them into the graphics 'STACK' area, shown at the end of the listing, the routine repeats the sequence for the remainder of the parameter list to get the finish point co-ordinates. Note that the GETPARS routine does not check for separators, so both:
LINE3D 50,50,50 TO 90,90,90
and: LINE3D 50,50,50,90,90,90
would be equally valid.

Once that is done, the 'STACK' area should hold both the start and finish line co-ordinates, converted into two-dimensional floating point screen co-ordinates, on a stack resembling that shown in figure four. This is for use by the TRAP£3 graphics function SD.LINE to draw a line between two points. It is essential that at least 240 bytes are reserved on this

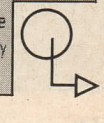
Fig 3

```
 LOC       OBJECT          STMT          SOURCE STATEMENT

                            1 *
                            2 *  Three-Dimensional Plotting Routine
                            3 *
0000'  3078 0110            4             MOVE.W   $110,A0       $110 = BP.INIT
0004'  43FA 0006            5             LEA.L    PROC,A1       Link in procedure
0008'  4E90                 6             JSR      (A0)
000A'  4E75                 7             RTS
000C'  0001                 8 PROC        DC.W     1             Number of procedures
000E'  0010                 9             DC.W     LINE3D-*      Relative location of proc
0010'  06                  10             DC.B     6             Length of proc name
0011'  4C49 4E45 3344      11             DC.B     'LINE3D'      Name of proc
0018'  0000                12             DC.W     0             End of procedures
001A'  0000                13             DC.W     0             Number of functions
001C'  0000                14             DC.W     0             End of functions
                           15 *
                           16 * Start of LINE3D code
                           17 *
001E'  6100 0062           18 LINE3D     BSR      GETCHAN              Get the output channel
0022'  6600 0056           19            BNE      L3EXIT
0026'  48E7 001C           20            MOVEM.L  A3-A5,-(A7)
002A'  2A4B                21            MOVEA.L  A3,A5
002C'  DBFC 0000 0018      22            ADDA.L   #24,A5
0032'  6100 008A           23            BSR      GETPARS              Get the start coordinates
0036'  6600 0044           24            BNE      ERREXIT              Branch on error
003A'  47FA 01EE           25            LEA.L    STACKEND-12,A3       A3 = Graphics stack line start
003E'  6100 0090           26            BSR      CALC3D               Set 3D to 2D coordinates
0042'  4CDF 3800           27            MOVEM.L  (A7)+,A3-A5
0046'  6600 0032           28            BNE      L3EXIT               Branch on error
004A'  D7FC 0000 0018      29            ADDA.L   #24,A3               A3 = Finish coordinates
0050'  6100 006C           30            BSR      GETPARS              Get the finish coordinates
0054'  6600 0024           31            BNE      L3EXIT               Branch on error
0058'  47FA 01C4           32            LEA.L    STACKEND-24,A3       A3 = Graphics stack line end
005C'  48E7 0008           33            MOVEM.L  A4,-(A7)
0060'  6100 006E           34            BSR      CALC3D               Set 3D to 2D coordinates
0064'  4CDF 1000           35            MOVEM.L  (A7)+,A4
0068'  6600 0010           36            BNE      L3EXIT               Branch on error
006C'  76FF                37            MOVEQ    #-1,D3               D3 = Infinite Timeout
006E'  2076 C800           38            MOVE.L   0(A6,A4.L),A0        A0 = Channel ID
0072'  43FA 01AA           39            LEA.L    STACKEND-24,A1       A1 = Graphics stack pointer
0076'  7031                40            MOVEQ    #$31,D0              $31 = SD.LINE
0078'  4E43                41            TRAP     #3
007A'  4E75                42 L3EXIT     RTS
007C'  4CDF 3800           43 ERREXIT    MOVEM.L  (A7)+,A3-A5
0080'  4E75                44            RTS
                           45 *
                           46 * This routine will get the channel parameter, or default to
                           47 * channel #1. It will exit with (A6,A4.L) pointing to the start
                           48 * of the appropriate channel entry in the table.
                           49 *
                           50 * On exit, Zero Flag Set indicates error, held in D0.
                           51 *
0082'  1A36 B801           52 GETCHAN    MOVE.B   1(A6,A3.L),D5
0086'  0205 0080           53            ANDI.B   #128,D5              Check for '#' channel
008A'  6700 0022           54            BEQ      DEFCH                Branch to default channel
008E'  48E7 0014           55 GETCH      MOVEM.L  A3/A5,-(A7)

 LOC       OBJECT          STMT          SOURCE STATEMENT

0092'  2A4B                56            MOVEA.L  A3,A5
0094'  508D                57            ADDQ.L   #8,A5                A5=A3+8 = Just first parameter
0096'  3078 0112           58            MOVE.W   $112,A0              $112 = CA.GTINT (Get integer)
009A'  4E90                59            JSR      (A0)
009C'  4CDF 2800           60            MOVEM.L  (A7)+,A3/A5
00A0'  6600 001A           61            BNE      GCEXIT               Branch on error
00A4'  3236 9800           62            MOVE.W   0(A6,A1.L),D1        D1 = Channel No.
00A8'  508B                63            ADDQ.L   #8,A3                A3 = Start of X,Y,Z data
00AA'  6000 0004           64            BRA      SETCHAN
00AE'  7201                65 DEFCH      MOVEQ    #1,D1                D1 = Channel No.1 (Default)
00B0'  7428                66 SETCHAN    MOVEQ    #$28,D2              D2 = Length of channel entry
00B2'  C2C2                67            MULU     D2,D1                D1 = Offset
00B4'  286E 0030           68            MOVE.L   48(A6),A4            A4 = Start of channel table
00B8'  D9C1                69            ADDA.L   D1,A4                A4 = Start of channel entry
00BA'  4280                70            CLR.L    D0                   Signal no error
```



DIY TOOLKIT

```
00BC' 4E75                    71 GCEXIT   RTS
                              72 *
                              73 * This routine will place the next three parameters onto the
                              74 * arithmetic stack, as floating point numbers.
                              75 * The first time this is called, these will be the starting coordinates
                              76 * and the second time, they will be the finish coordinates.
                              77 *
00BE' 3078 0114               78 GETPARS  MOVE.W   $114,A0          $114 = CA.GTFP (Get fl. point)
00C2' 4E90                    79          JSR      (A0)
00C4' 6600 0008               80          BNE      GPEXIT           Branch on error
00C8' 70F1                    81          MOVEQ    #-15,D0          D0 = Parameter Error
00CA' 0C03 0003               82          CMPI.B   #3,D3            Should be 3 parameters
00CE' 4E75                    83 GPEXIT   RTS
                              84 *
                              85 * This routine expects the 3D X,Y,Z values on the arithmetic stack.
                              86 * It performs the calculations: x=X*100/Z and y=Y*100/Z
                              87 * and places the x and y values onto the graphics stack,
                              88 * pointed to by A3. On exit, the flags indicate an error (in D0).
                              89 *
00D0' 720C                    90 CALC3D   MOVEQ    #12,D1           Get 12 bytes on stack
00D2' 2D49 0058               91          MOVE.L   A1,$58(A6)
00D6' 3478 011A               92          MOVE.W   $11A,A2          $11A = BV.CHRIX
00DA' 4E92                    93          JSR      (A2)
00DC' 226E 0058               94          MOVE.L   $58(A6),A1
00E0' 5589                    95          SUBQ.L   #2,A1            Place 100(fp) on TOS
00E2' 3DBC 0064 9800          96          MOVE.W   #100,0(A6,A1.L)  100(int) to TOS
00E8' 7008                    97          MOVEQ    #$8,D0           D0 = RI.FLOAT
00EA' 3478 011C               98          MOVE.W   $11C,A2          $11C = RI.EXEC
00EE' 4E92                    99          JSR      (A2)             TOS = 100(fp)
00F0' 5DB9                   100          SUBQ.L   #6,A1            Copy 'Z' to TOS
00F2' 3DB6 9818 9800         101          MOVE.W   24(A6,A1.L),0(A6,A1.L)    Z-exponent
00F8' 2DB6 981A 9802         102          MOVE.L   26(A6,A1.L),2(A6,A1.L)    Z-mantissa
00FE' 7010                   103          MOVEQ    #$10,D0          D0 = RI.DIV
0100' 4E92                   104          JSR      (A2)             TOS = '100/Z'
0102' 4A00                   105          TST.B    D0
0104' 6600 003E              106          BNE      C3EXIT           Branch on error
0108' 3DB6 9800 9812         107          MOVE.W   0(A6,A1.L),18(A6,A1.L)  Copy '100/Z' to BOS
010E' 2DB6 9802 9814         108          MOVE.L   2(A6,A1.L),20(A6,A1.L)
0114' 700E                   109          MOVEQ    #$E,D0           D0 = RI.MULT
0116' 4E92                   110          JSR      (A2)             TOS = 'X*100/Z'

 LOC       OBJECT          STMT           SOURCE STATEMENT

0118' 4A00                   111          TST.B    D0
011A' 6600 0028              112          BNE      C3EXIT           Branch on error
011E' 3776 9800 0006         113          MOVE.W   0(A6,A1.L),6(A3)  Copy TOS to Graphics COORDS
0124' 2776 9802 0008         114          MOVE.L   2(A6,A1.L),8(A3)
012A' 5C89                   115          ADDQ.L   #6,A1
012C' 700E                   116          MOVEQ    #$E,D0           D0 = RI.MULT
012E' 4E92                   117          JSR      (A2)             TOS = 'Y*100/Z'
0130' 4A00                   118          TST.B    D0
0132' 6600 0010              119          BNE      C3EXIT           Branch on error
0136' 3776 9800 0000         120          MOVE.W   0(A6,A1.L),0(A3)  Copy TOS to Graphic COORDS
013C' 2776 9802 0002         121          MOVE.L   2(A6,A1.L),2(A3)
0142' 4280                   122          CLR.L    D0               Signal No Error
0144' 4E75                   123 C3EXIT   RTS
                             124 *
                             125 * Graphics Stack area (Must be at least 240 bytes)
                             126 *
0146' =00F0                  127 STACK    DS.B     240
0236'                        128 STACKEND
                             129
                             130          END
```

stack area when using the graphics routines. Hence even though the assembly code is only about 350 bytes long, you must reserve 600 bytes of resident memory area when loading the routine.

Figure five shows this routine in the form of a hex loader. Type this in and, when it finishes, type the following:

S BYTES
mdv1_plot,start,600

to save the routine to Microdrive.

Once this is done, you can test the routine using the demonstration program in figure six. This is based on the demonstration program for a similar command in the Computer Concepts Graphics ROM for the BBC micro. It draws and moves a cube round the screen, based on inputs from the keyboard. Type:

"U" for Up
"L" for Left
"D" for Down
"R" for Right
"I" to move Into the screen
"O" to move Out of the screen.

You will also notice that SCALE has been used to shift the origin to the centre of the defined window — Channel 3. That has the effect of moving the eye to the centre of the window, since it is positioned at the origin, looking down the positive Z-axis. Try running the program without line 120 to see what effect that has.

To run the demonstration program in figure six you will have to set up the LINE3D command. That is done with the following instructions:

a = RESPR(600)

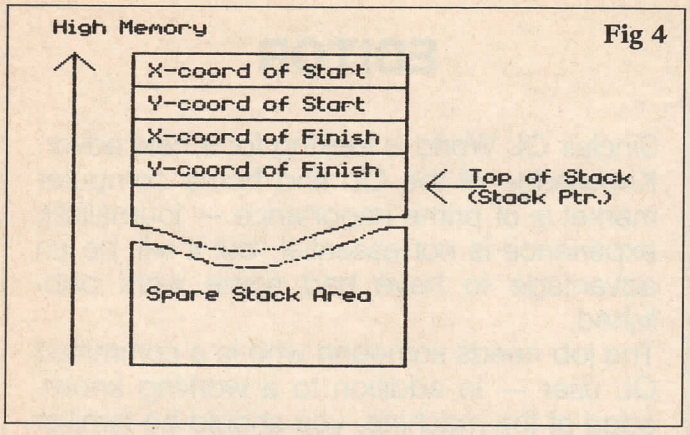


Fig 4

Fig 5

```
100 REMark : Sinclair QL World
110 REMark : ** HEX  LOADER **
120 :
130 CLS
140 RESTORE : READ space
150 start = RESPR(space)
160 PRINT"Loading Hex...":hex_load start
170 CALL start
180 STOP
190 :
200 :
210 DEFine PROCedure hex_load(start)
220 :
230     DEFine FuNction decimal(x)
240     RETurn CODE(h$(x))-48-7*(h$(x)>"9")
250     END DEFine decimal
260 :
270 byte = 0 : checksum = 0
280 RESTORE 2000
290 READ h$ : IF h$="*" THEN GO TO 450
300 IF LEN(h$)<>2*INT(LEN(h$)/2) THEN
310     PRINT"Odd number of hex digits in: ";h$
320     STOP
330 END IF
340 FOR b=1 TO LEN(h$) STEP 2
350     hb=decimal(b):lb=decimal(b+1)
360     IF hb<0 OR hb>15 OR lb<0 OR lb>15 THEN
370        PRINT"Illegal hex digit in: ";h$
380        STOP
390     END IF
400     POKE start+byte,16*hb+lb
410     checksum=checksum+16*hb+lb
420     byte=byte+1
430 END FOR b
440 GO TO 290
450 READ check
460 IF check<>checksum THEN
470     PRINT"Checksum incorrect. Recheck data."
480     STOP
490 ELSE
500     PRINT"Checksum is correct."
510     PRINT"Data entered at: ";start
520 END IF
530 END DEFine hex_load
1000 DATA 600
2000 DATA "3078011043FA0006","4E904E7500010010"
2010 DATA "064C494E45334400000000000000"
2020 DATA "6100006266000056","48E7001C2A4BDBFC"
2030 DATA "000000186100008A","6600004447FA01EE"
2040 DATA "610000904CDF3800","66000032D7FC0000"
2050 DATA "00186100006C6600","002447FA01C448E7"
2060 DATA "00086100006E4CDF","10006600001076FF"
2070 DATA "2076C80043FA01AA","70314E434E754CDF"
2080 DATA "38004E751A36B801","02050080670000022"
2090 DATA "48E700142A4B508D","307801124E904CDF"
2100 DATA "28006600001A3236","9800508B60000004"
2110 DATA "72017428C2C2286E","0030D9C142804E75"
2120 DATA "307801144E906600","000870F10C030003"
2130 DATA "4E75720C2D490058","3478011A4E92226E"
2140 DATA "005855893DBC0064","9800700834780110"
2150 DATA "4E925D893DB69818","98002DB6981A9802"
2160 DATA "70104E924A006600","003E3DB698009812"
2170 DATA "2DB698029814700E","4E924A0066000028"
2180 DATA "37769800000062776","980200085C89700E"
2190 DATA "4E924A0066000010","37769800000002776"
2200 DATA "9802000242804E75","*",22696
```

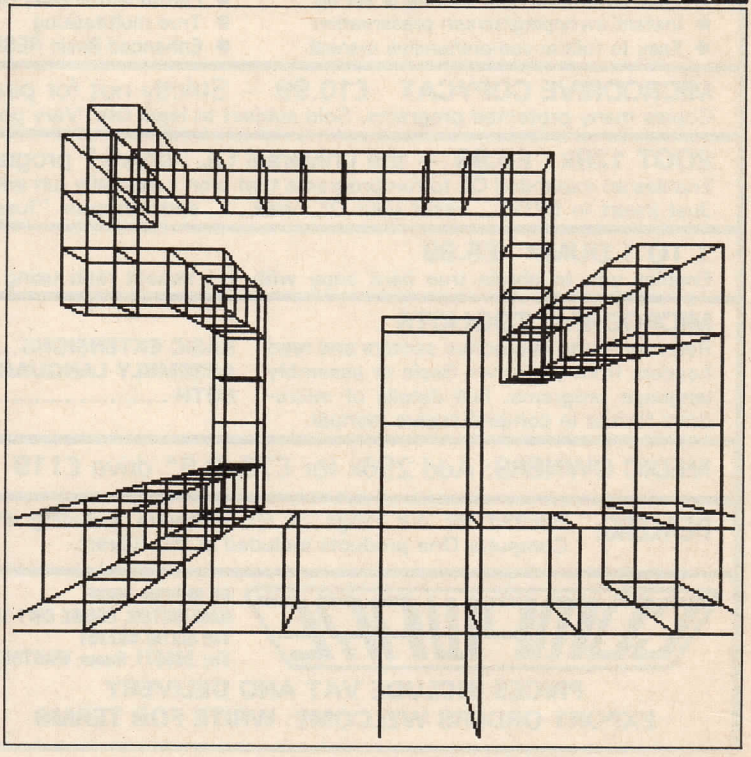
Fig 6

```
100 OPEN#3,scr_400x200a60x0
110 BORDER#3,3,2
120 SCALE#3,250,-175,-125
130 CLS#3
140 d=0:e=0:f=300
150 REPeat loop
160 a$="":a$=INKEY$:IF a$="" THEN GO TO 160
170 IF a$=="u" THEN e=e+50
180 IF a$=="d" THEN e=e-50
190 IF a$=="l" THEN d=d-50
200 IF a$=="r" THEN d=d+50
210 IF a$=="i" THEN f=f+50
220 IF a$=="o" THEN f=f-50
230 RESTORE
240 FOR i = 1 TO 12
250 READ a1,b1,c1,a2,b2,c2
260 LINE3D#3,a1+d,b1+e,c1+f TO a2+d,b2+e,c2+f
270 END FOR i
280 END REPeat loop
290 :
300 DATA 0,0,0,50,0,0
310 DATA 50,0,0,50,0,50
320 DATA 50,0,50,0,0,50
330 DATA 0,0,50,0,0,0
340 DATA 0,0,0,0,50,0
350 DATA 0,50,0,50,50,0
360 DATA 50,50,0,50,50,50
370 DATA 50,50,50,0,50,50
380 DATA 0,50,50,0,50,0
390 DATA 0,50,50,0,0,50
400 DATA 50,50,50,50,0,50
410 DATA 50,50,0,50,0,0
```

L BYTES mdv1_plot,a
CALL a

The uses of this routine are limited only by your imagination. It could be used to produce three-dimensional charts for business, plot three-dimensional graph functions, or even to produce wire-frame graphics for 3D games.

Remember that we want to hear from anybody who has ideas for useful routines which they would like to see in future DIY Toolkit articles. We are looking particularly for short and unusual routines which have not already appeared many times in books and commercial toolkit software.



EDITOR

Sinclair QL World is looking for a new editor. Knowledge of the QL and home computer market is of prime importance — journalistic experience is not essential, but it will be an advantage to have had some work published.

The job needs someone who is a committed QL user — in addition to a working knowledge of the machine, you should be familiar with the major developments in QL software and hardware over the last twelve months.

Candidates should be qualified to at least A level standard.

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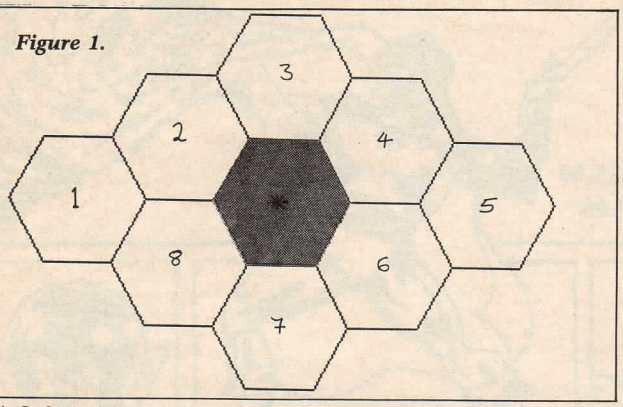
PUZZLE PAGE

Marcus Jeffery provides more abstract entertainment on a hexagonal theme and reveals the solution to February's mathematical musings.

If you have finished playing with tanks from last month I have a more abstract puzzle for you. Figure one shows the layout of the puzzle board, consisting of eight numbered hexagons (hexes) and a blank hexagon in the middle. From now this arrangement of numbers will be termed the home position and will be represented as:

Figure 1.



1 2 3 4 5 6 7 8 *

The puzzle works by flipping hexes. An adjacent numbered hex can be flipped only with the blank hex and this operation effectively swaps the two hexes. So, given the home position, if we were to flip the blank hex with Hex 2, we would get the position:

```
    3
  *   4
1   2   5
  8   6
    7
```

or:

1 * 3 4 5 6 7 8 2

There are six possible flips available from the home position. They are:

Flip 2 -> 1 * 3 4 5 6 7 8 2
Flip 3 -> 1 2 * 4 5 6 7 8 3
Flip 4 -> 1 2 3 * 5 6 7 8 4
Flip 6 -> 1 2 3 4 5 * 7 8 6
Flip 7 -> 1 2 3 4 5 6 * 8 7
Flip 8 -> 1 2 3 4 5 6 7 * 8

All I want to know is how many flips are necessary to reach the home position from the worst possible position. The worst position is defined as the position which will require more flips to reach the home position than any other. In fact, there is more than one worst position but it does not matter which one you use.

RULES

Entries must be sent by post to: PUZZLE PAGE, Sinclair QL World, 79-80 Petty France, London SW1H 9ED to arrive not later than Monday, April 13, 1987.

The winner will be the first correct entry drawn from the editor's hat.

All entries will be judged by the editor of *Sinclair QL World*. The editor's decision is final and no correspondence will be entered into regarding the result.

ENTRY FORM

Number of Flips from the worst start position is:

.....

Name .....

Address .....

.....

.....

The problem was to find the sum of the digits in the 5,000th term in the expansion of the series:

$$5^{i!} + 7^{j!} + 11^{k!}$$

where i,j,k > 0

I warned you that it was an incredibly big number. I think the comment made by J. Forrest best explains how big. He said: "I calculated that if you were to write it on sheets of A4 paper you would need about 2.5 thousand billion sheets, which would form a pile about 100,000 miles high."

I would like to thank T. Wilkinson for his explanation of how to do this, which is far clearer than the method I used. What he did was to try to find a condition for $5^{x!}$ which exceeds that of $3*11^{(a-1)!}$. He did it using the following method:

(a) Start with the condition:

$$5^{x!} > 3*11^{(x-1)!}$$

(b) Take logarithms on both sides:

$$x! * \log 5 > (x-1)! * \log 11 + \log 3$$

(c) Divide by $(x-1)! * \log 5$:

$$\frac{x!}{(x-1)!} > \frac{\log 11}{\log 5} + \frac{\log 3}{(x-1)! * \log 5}$$

(d) Evaluate the expression:

$$x > 1.490 + 0.683/(x-1)! \text{ for } x > 2.$$

That establishes that the lowest term containing x! as an exponent exceeds all those where x! is not attained. Similarly, (x+1)! is not met until 'i', 'j' and 'k' have all reached x. That means the value of 'i' will not reach, say, 10, until all combinations of 'j' and 'k' between 1 and 9 have been used.

Based on this method, we find that the nearest term to the 5,000th, where i=j=k is 4913 — ie., 17^3. The next term will then be $5^{18!}+7^{1!}+11^{1!}$, the next will be $5^{18!}+7^{2!}+11^{1!}$, then $5^{18!}+7^{1!}+11^{2!}$, and so on. Continuing with this method, we find that the 5,000th term is:

$$5^{18!} + 7^{10!} + 11^{6!}$$

Unfortunately, having found the term, we now have to calculate the number:

$$5^{64023730685728000} + 7^{3628800} + 11^{720}$$

I am sure that even a Cray supercomputer would find the task rather daunting. We know, however, that the number does not have a list of trailing zeros, as would be the case, say, with $10^{x!}$, but contains digits throughout. Therefore, by assuming that the average digit is:

$$(01+2+3+4+5+6+7+8+9)/10 = 4.5$$

Which will not be too inaccurate for a number of this size, we can estimate the answer. Again taking logarithms:

$$18! * \log_{10}5 + 10! * \log_{10}7 + 6! * \log_{10}11 = 4.475 * 10^{15}$$

Because we have taken logarithms to the base 10, the number of digits in the result will be the integer part of this number plus one. Thus, we can finally estimate our answer as being:

$$4.5 * 4.4475 * 10^{15} = 2.014 * 10^{16}$$

I was therefore accepting any entry forms with an answer of $2 * 10^{16}$ or better.

The winner this month is Peter Eldred of Wokingham, Berkshire, who will be receiving a year's free subscription to

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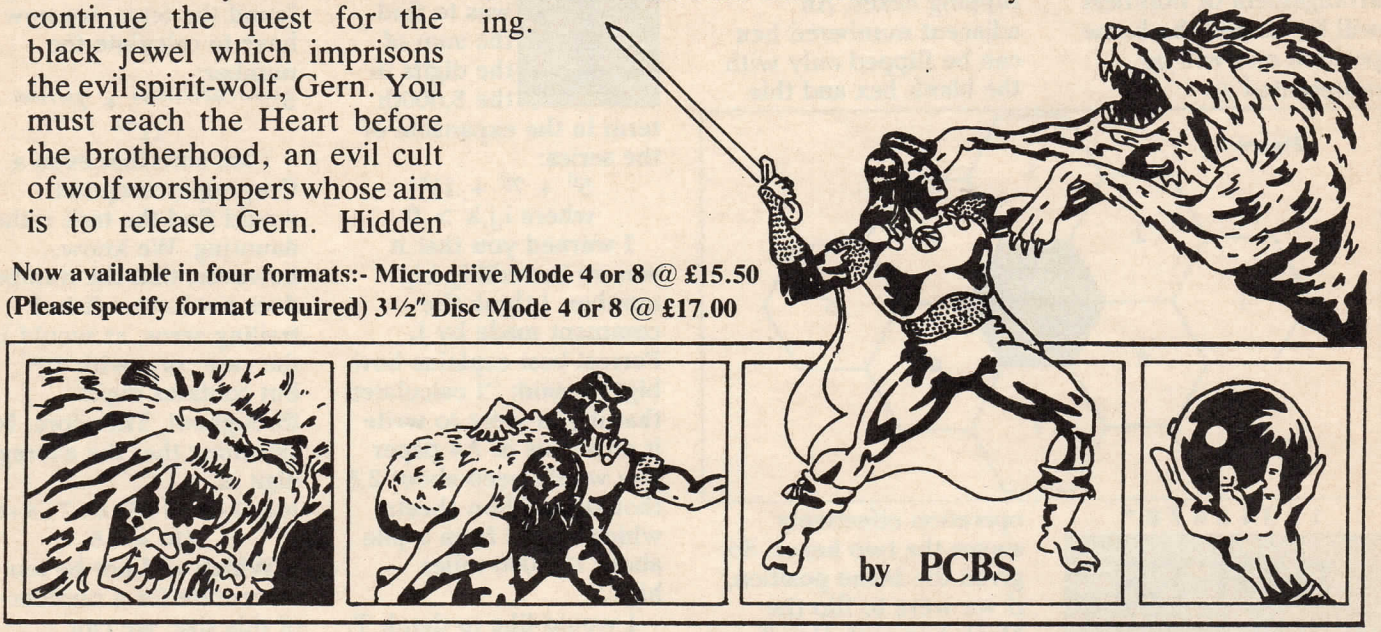

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UTILITY FILE

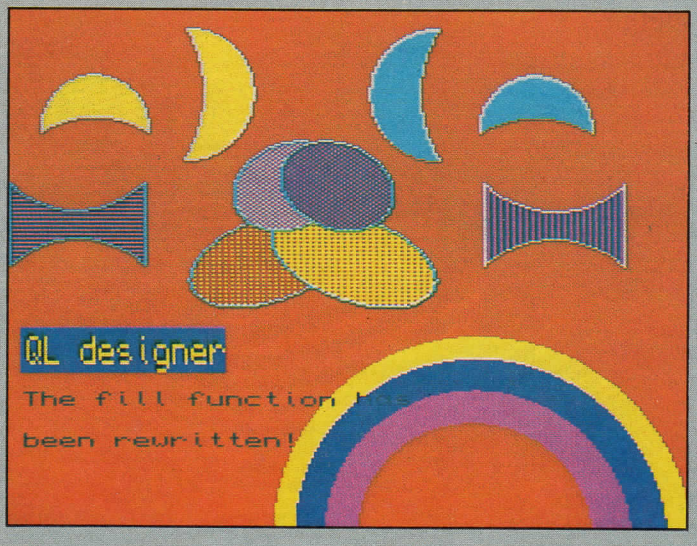
Ron Massey provides our regular round-up of all that is new on the serious software scene.

QL Designer Pyramide £19.95

The new Pyramide graphics program, *QL Designer*, utilises QL turtle graphics and produces files more related to character files than to the more usual binary screen dumps. For that reason, files are typically compact, usually occupying less than 3K of media space.

Drawings made with Designer can be saved in layers, a method more common among animators than computer artists; backgrounds, foreground objects included thereon and text can be treated as separate considerations.

Backgrounds can be saved as files and individual objects, such as often-used electronic components — or other repetitive symbols, technical or otherwise — can be saved as cells and loaded subsequently into a palette for use in a current drawing.

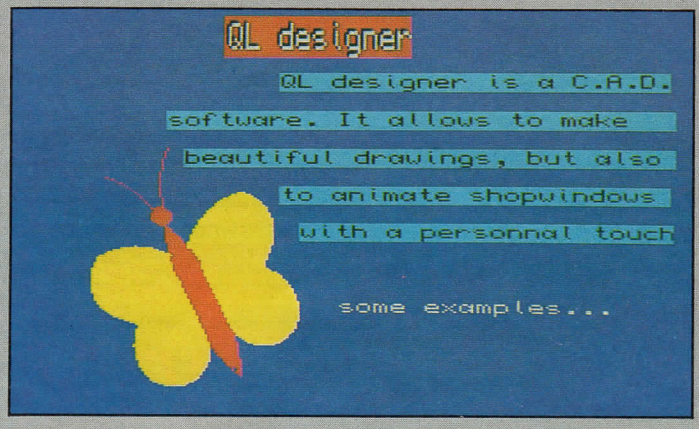


Drawing and the subsequent alteration of a drawing occur at two levels. From the user's point of view, making changes is very little different from any other drawing program, with the exception that each segment of the portion of the drawing being changed is offered, in the same sequence as it was originally made, for alteration.

You have an option of setting the shape or colour of a segment, either outline, fill or stipple — in any combination — using the Designer's rather slick colour-selection menu. When the changing sequence is completed, the altered element is re-drawn either at its current position or at a new specified position.

Looking at the editing sequence from the program point of view, the process is more like editing a character file, where the positioning data, colour, and other picture information is stored.

One of the difficulties presented by the QL for Designer, and to most other graphics programs, is the ability to fill re-entrant shapes successfully. Designer has overcome the problem by including its exceptional FILL routine.



One of the interesting features of Designer, useful for shop window, exhibition stand or educational applications, is that once you have acquired a collection of pictures you have the option of re-playing them in a continual display. From a menu, you can choose to re-play your pictures in a particular order, or not, and include a specified time delay between each picture.

QL Designer has been written so that users have the option of using the program entirely with keyboard input or, with small alterations to the boot program, drawing with the Eidersoft mouse system. Either way, with the exception of text, almost all command input is made using single key-presses. Of the consistently high standard on which Pyramide has established its reputation, QL Designer is a very flexible program.

XREF PDQL £15

From the PDQL rapidly-growing collection of programs authored by Chas Dillon is one of the most valuable development utilities I have seen, *PDQ-XREF*.

Using PDQ-XREF could not be simpler Load Turbo Toolkit, load your SuperBasic program EXEC PDQ-XREF and follow the screen prompts. Once past the default set-up page, the program is entirely automatic.

A number of options from the set-up page allow you to print a

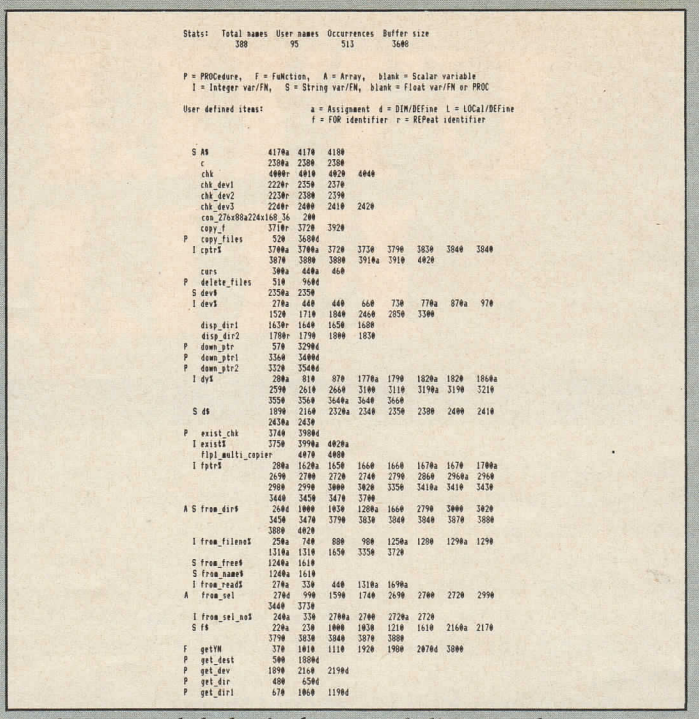
UTILITY FILE

program report to drive, screen or printer. Choosing the latter, more options are available for formatting a page to suit your particular record-keeping system and setting-up the output file generated to serial or parallel ports.

You have the option when PDQ-XREF starts up to obtain a complete report or, where that is not required, produce only the exception listing.

Up and running, PDQ-XREF analyses your SuperBasic program in memory and, after a period of thinking, details the statistics concerning your program — the total number of Names, User names, the number of occurrences and buffer size.

The next report



```
Stats:  Total names  User names  Occurrences  Buffer size
             388          95          513         3608

P = PROCedure,  F = FuNction,  A = Array,  blank = Scalar variable
I = Integer var/FN,  S = String var/FN, blank = Float var/FN or PROC

User defined items:          a = Assignment  d = DIM/DEFine  L = LOCal/DEFine
                             f = FOR identifier  r = REPeat identifier

  S A$              4170a  4170  4180
    c               2380a  2380  2380
    chk             4000r  4010  4020  4040
    chk_dev1        2220r  2350  2370
    chk_dev2        2230r  2300  2390
    chk_dev3        2240r  2400  2410  2420
    con_276x88a224x168_36    200
    copy_f          3710r  3720  3920
  P copy_files       520  36004
  I cptr%           3700a  3700a  3720  3730  3790  3830  3840  3840
                    3870  3880  3880  3880  3910a  3910  4020
    curs             300a  440a  460
  P delete_files     510  9604
  S dev$            2350a  2350
  I dev%             270a  440  440  660  730  770a  870a  970
                    1520  1710  1840  2460  2850  3300
    disp_dir1       1630r  1640  1650  1680
    disp_dir2       1700r  1790  1800  1830
  P down_ptr         570  32904
  P down_ptr1       3360  34004
  P down_ptr2       3320  35404
  I dy%              280a  810  870  1770a  1790  1820a  1820  1860a
                    2590  2610  2660  3100  3110  3190a  3190  3210
                    3550  3560  3640a  3640  3660
  S d$              1890  2160  2320a  2340  2350  2380  2400  2410
                    2630a  2630
  P exist_chk       3740  39004
  I exist%          3750  3990a  4020a
    flp1_multi_copier     4070  4080
  I fptr$            280a  1620a  1650  1660  1660  1670a  1670  1700a
                    2690  2700  2720  2740  2790  2860  2960a  2960
                    2980  2990  3000  3020  3350  3410a  3410  3430
                    3440  3450  3470  3700
A S from_dir$        260d  1000  1030  1280a  1660  2790  3000  3020
                    3450  3470  3790  3830  3840  3840  3870  3880
                    3880  4020
  I from_file$       250a  740  880  980  1250a  1280  1290a  1290
                    1310a  1310  1650  3350  3720
  S from_free$      1240a  1610
  S from_name$      1240a  1610
  I from_read%       270a  330  440  1310a  1690a
A   from_sel         270d  990  1590  1740  2690  2700  2720  2990
                    3440  3750
  I from_sel_no%     240a  330  2700a  2700  2720a  2720
  S f$               220a  230  1000  1030  1210  1610  2160a  2170
                    3790  3830  3840  3870  3880
  F getYN           370  1010  1110  1920  1980  2070d  3800
  P get_dest        500  18004
  P get_dev         1090  2160  21904
  P get_dir         480  6504
  P get_dir1        670  1060  11904
```

produces an alphabetical listing for each program procedure, function, array, scalar variable, integer or string variable or function and user-defined terms for assignment, DIM/Define, Local/Define, FOR and Repeat Identifiers and each line number on which they occur. The penultimate report includes all system and extension commands or functions encountered in the program.

At the tail end of the report is an exception listing and the line number of the first occurrence of any found. From a developer's point of view, this may well be the most valuable service performed by PDQ-XREF. In addition to any dead wood found in a program, the exception list includes all occurrences of apparently unused program operatives which could point to possible problems.

Particularly useful for large programs, although size does not matter, a PDQ-XREF report for a 3,000-line program, for example, can exceed 16 pages of detailed information.

Whether you are a complete beginner or a seasoned programmer, PDQ-XREF is an indispensible aid for extracting salient details from a Basic program not otherwise easily obtainable — at least not without having to spend hours collating information from a listing.

UTILITY FILE EXTRA

Ron Massey reports on the latest software updates.

The latest release of *Taskmaster* has been revised almost to the point of being a completely new system built round the original concept. No fewer than 19 new features have been added, one of the most interesing being the facility to go into a "learning" mode, "memorising" virtually any kind of input, which can be saved as a file.

Complete standard forms, Quill page formats, price lists and similar requirements are only a few of the possibilities available for using Command Files.

Taskmaster is now supplied on disc and Microdrive. Sector Software, relying on protection by copyright laws and user integrity, no longer requires a tie to the master cartridge being present in mdv2_ on start-up.

File options include copying individual files, back-up of an entire medium, re-naming files, add another program to those currently running, media formatting and directory.

When adding another program to those already running, you assign memory allocation and whether or not to have the new program use code-sharing mode. With full duplicate code-sharing ability, up to 12 spreadsheets can be held in memory with 230K free memory still available. Any new programs started with this option appear on the Input Desk automatically.

Adding programs to the multi-tasking environment has been made more flexible and key assignments for program calls have been changed slightly to accommodate the facility. Up to eight programs can be placed on the Input Desk and are called by using the <ALT> and 1 to 8 number keys; <ALT> <9> returns you to Basic; <ALT> <F1> recalls the input desk; <ALT> and a number key will take you directly to the program assigned to the key.

Memory allocations with a minimum of 10K per program can be defined for each file. Where an allocation is too small for a program, the entry is ignored. By using the once-run patch supplied, changing the access key from <ALT> to <ALT> <SHIFT>, the Psientific *Key Define* can now be used with Taskmaster.

The notepad module includes word wrap, file save and load options, edit and ZAP. Access to the Taskmaster Command learning module is on the Notepad Menu.

The Taskmaster calculator now supports "raise to the power of" and retains the last number entered. Processing a group of numbers will produce a running total each time the <ENTER> key is pressed. Results of a calculation can, using <SHIFT> <ESC>, be

QL Sideways Print Talent Computer Systems £19.95

A limitation of all text editors is that finished documents are printed as viewed on-screen. To produce A5 manuals or similar publications, A4 copy must be reduced with a photocopying machine; for small print runs reductions tend to be expensive.

Talent *QL-Sideways* solves most if not all of the problems associated with publishing, where small numbers of professional-quality documents are needed.

A text-only package, Sideways uses documents containing printer control codes such the Quill *_lis* files made by using "print to Microdrive" — or disc — instead of printer command.

System formats support Simple, Complex/ Spreadsheet or Booklet options. Simple document formatting consists of single sheets of printed text; Complex documents format all text pages as a single large unit or can amalgamate any number of text pages in poster format. Booklet mode offers either of two formats, Edge-bound or Centre-bound.

Edge-binding is formatted with pages one and two printed on obverse and reverse sides of a page respectively. Left and right margins alternate for successive pages. Centre-bound documents are formatted so that, when assembled, using a six-page booklet as an example, the page sequence reads 1, 2, 3, 4, 5, 6, blank, blank.

Once you have established the final form systems options ask if the block of text should be re-positioned on the page, to choose either full character width — 19/216 in. — or half-width — 10/ 216 in. — change the form width or number of lines per page and multiple pages for the Simple and Complex printing modes.

The font selection menu asks for the device containing font *_defn* files. Selecting a font from the directory menu installs the font. You have the option of designing your own character sets but fonts must be designed using the Sideways font editor. Fonts produced by other programs such as Eye-Q or Nucleon font editors are not compatable with Sideways.

Sideways presents the user with very few limitations. Because some of the character control codes interfere with its operation, only Bold, Enhanced and Underline options are supported. Other control codes are ignored.

Compatible with standard and expanded QLs, the main limitation is the printer. Designed to be used with Epson FX-80 or compatible printers, Sideways utilises the user-defined character mode available on the FX-80 and will not function without it.

Users with Canon PW1080 or Taxan/Kaga printers must have the 3K buffer — DIP switch 2–3 — in the off position.

I found Sideways an excellent program and particularly easy to use. Entirely menu-driven, most of the commands are made from single key entries. I felt that a re-configuration program, with drive options defaulting to those chosen by the user, should have been included. Also par is not supported and its emulation must be added to the Sideways BOOT.

sent to the program currently running at the cursor position.

When exiting Taskmaster, a software re-set routine first looks to see if any files are open. If so, a screen warning indicates which files require closing; if not, a key press will software reset your QL.

In his report, Marcus Jeffrey described Taskmaster as the Rolls-Royce of the Multi-taskers. I suppose in that sense, Taskmaster is now top of the Rolls-Royce range. What else is left? The first of what will probably be many new or revised programs to be released using *Turbo* and *Turbo Tookit, The Editor* is faster and better than ever. Taking advantage of more compact code produced by Turbo — previous versions were compiled with Supercharge — something of the order of 15 percent new features have been added to the already impressive Editor command structure.

Searches can now be made on the basis of minimum or maximum line lengths with the new NT and NS commands. When used with the RP command, a report will be made of the number of lines having the parameters set by NT or NS.

The range of text file formatting commands has been enhanced — TA, for asymmetric tab points; TR, removing tap points; TI, insertion of tab points; TD, deleting tab points; TC, tabs compression or its reverse option, TE; CP has been added to move the cursor to the start of a paragraph; SI, for setting the indent margin.

Find and exchange — F and E — commands have been expanded so that string searches made with two special characters, "<" and ">", will be found only where the string is located at the beginning ("<") or end (">") of a line.

A command for deleting a memory file, Z — the ZAP command familiar to Psion program users — will offer a second chance to abort the command if a change has been made to a memory file but has not yet been saved to a drive. Otherwise the file is deleted from memory and the screen is cleared.

Overall, Editor has a smoother feel about it. Cursor over-shoot in row and column has been greatly reduced, as has file loading time.

A point raised by Freddy Vachha of Digital Precision is that, where users are specially concerned with program speed, special versions of almost any program compiled with Turbo can be optimised for speed as its principal parameter. That it will also mean an increase in program size could be of little importance for those seeking Maserati performance.

Information

PDQ-XREF	PDQL, 49 Frederick Street, Birmingham B1 3HN Tel: 021 233 3042
QL Sideways Print Technikit	Talent Computer Systems, 101 St James Road, Glasgow G4 0NS Tel: 041 552 2128
QL Designer	Rio Promotions, 28 Waverly Grove, London N3 3PX Tel: 01-349 2764

CST QL Expansion

from the creators of . . . Thor

QDISC
new eprom 1.19

The best-selling floppy disc interface (now issue 4) is fitted with a 16K EPROM containing many 'Toolkit' extensions, and CST's new Ram Drive 2. It may be used with most 3·5″ or 5·25″ floppy disc drives, CST's own twin slimline double sided 80 track 3·5″ units being exceptional value for money, with 720K of formatted storage per drive. The Toolkit provides a wide range of SuperBASIC commands and functions designed to improve access to the powerful facilities of the QL without the need for machine-code programming. Job control is made easier, files can be used for random access, alternative character sets can be produced, 'wild cards' can be used in file operations, etc.

Ram Drive
the fastest ever!

The Ram Drive device driver allows free memory to be used as though it were a very high speed disc, in fact the fastest such device when used with the RAM-plus. Ideally used for the storage of temporary results, or multiple screen images for animated displays, it also eases the copying of files in single disc systems. The Ram Drive can only use memory which is free, so the full advantage is only felt if the QL is equipped with additional memory. Built into QDisc 4 and Thor, the Ram Drive is also available on 3·5″ and 5·25″ floppy disc.

RAM plus

The CST RAM-plus unit expands the available memory of the QL to the limit of 640K. Using high grade 256K memory devices, this unit is the only one which offers the high performance of no wait-state operation. Housed in a rugged metal case, the RAM-plus unit has an expansion slot which duplicates the QL's, allowing any other CST peripheral to be used. Among the advantages derived from using the RAM-plus are the performance improvements of software and storage devices, and the ability to multitask several programs at once.

SCSI

CST's Interface for Rodime compatable Winchesters handles up to 8 SCSI devices and is complete with floppy disc interface. Using enhanced QDISC software, it supports heirarchical directories, easing file management; with well over 1000 files being possible, this is absolutely essential. A Data Management Utility is provided which speeds up backups by only copying recently modified files.

Q-488

The Q-488 provides comprehensive yet simple access to the IEEE 488 Instrument Bus for the Thor and QL. Developed with IEEE specialists Procyon Research Ltd, the Q-488 interfaces to equipment directly from SuperBASIC and other languages and provides commands for low level bus control and even built-in bus analysis.

Thor

The CST Thor is the ultimate development of the QL. Available in single and dual floppy and 20M SCSI Winchester models each with 640K RAM, parallel printer and mouse ports, battery-backed clock and separate 84 key PC-AT style keyboard, it is built into an attractive metal case with internal power supply and expansion slot for peripherals. Supplied with many unique extensions to QDOS including multitasking at a single key-stroke, enhanced screen windowing and making full use of all the keys on the full-travel keyboard, the Thor is supplied with a specially commissioned version of the Psion Xchange software suite, and a comprehensive manual. Contact CST or your local distributor for details.

Cambridge Systems Technology
24 Green Street, Stevenage, Herts SG1 3DS
Telephone: Stevenage (0438) 352150

Please supply:–	UK inc VAT		Overseas	
Qdisc Interface 4 (3.5″ util. disc)	£79.95	☐	£72.70	☐
Qdisc Interface 4 (5.25″ util. disc)	£79.95	☐	£72.80	☐
QEP-III Eprom programmer (QL/THOR)	£115.00	☐	£103.20	☐
RAM-plus 512K QL memory	£139.95	☐	£125.20	☐
CST Dual 3.5″ cased floppy discs	£219.95	☐	£200.40	☐
CST Q-488 GPIB instrument interface	£224.25	☐	£198.40	☐
CST QDISC SCSI interface	£230.00	☐	£203.40	☐
Qdisc 4 + dual 3.5″ drives	£275.00	☐	£249.40	☐
Qdisc 4, RAM-plus + dual 3.5″ discs	£405.00	☐	£363.60	☐
3.5″ Utility disc inc. Ram Drive 2	£10.00	☐	£10.00	☐
5.25″ Utility disc inc. Ram Drive 2	£10.00	☐	£10.00	☐
Eprom V1.16 for issue 2/3 Qdisc	£15.00	☐	£15.00	☐
Eprom V1.19 for issue 4 QDisc	£15.00	☐	£15.00	☐
Thor 1F (Single floppy)	£688.85	☐	£620.00	☐
Thor FF (Dual floppy)	£803.85	☐	£720.00	☐
Thor WF (Winchester + floppy)	£1608.85	☐	£1420.00	☐
	Export administration		£5.00	☐
	Airmail outside Europe		£5.00	☐

Prices are inclusive of carriage
CST reserve the right to alter prices and specifications without prior notice

Name _____

Address _____

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Post Code _____ Telephone _____

I enclose a cheque/PO for £ _____

Please deduct my Access/Mastercard/Eurocard/Diners Club a/c

Card No. _____

Expiry Date _____

Signature _____

CST Thor TIMES CST
No. 870401

68020 Version Announced

Already at "beta test" sites for final validation the Thor-20 system, based on the Motorola MC68020 32 bit processor, is expected to be released by CST this month (April). The system will be available with an optional MC68881 Floating Point Coprocessor (FPC) and a choice of two clock speeds: 12.5 MHz and 16.7 MHz as compared with the 8 bit Thor's 7.5 MHz.

As well as by increasing the clock rate of the processor, performance is increased in two main areas. One is the MC68020's enhanced architecture which includes an on-chip instruction cache, a fast local memory which holds recently accessed instructions; the next time the instruction is executed (often soon afterwards) it does not need to be fetched from main memory, saving considerably on execution time; this increases performance by typically 3 times at 12.5 MHz. The other main improvement is the FPC which increases the performance of floating point operations up to 100 times in programs rewritten to use the FPC. The floating point utilities have been rewritten to make use of of the FPC, giving a dramatic performance improvement in SuperBASIC programs, screen graphics and other software using the utility vectors. Support software for other languages is being arranged.

The Thor-20 is supplied with complete supporting documentation, including Motorola's definitive User Manuals for the MC68020 and MC68881. Also provided is a suite of development software comprising an extended Macro Assembler by Talent Computer Systems which supports the full MC68020 and MC68881 instruction sets, and a Linker by GST. Projected prices for the 12.5 MHz version are £600 complete (ex VAT) and £425 without the MC68881, the 16.7 MHz version costing about twice this. These prices are in addition to the corresponding basic Thor, when either purchased complete, or as an upgrade to an existing Thor that is either still within its initial warranty period or covered by a current service contract.

CST Attacks International Market

As Thor sales increase in the UK, so too does international interest in this exciting system. Now not only is the range available direct from CST but also from a number of distributors who will cover a large proportion of the overseas markets. Of course a major advantage to the end user is the comprehensive post sales support, particularly valuable to overseas customers. Additionally on the software side, a wide range of foreign language versions of Xchange are being produced making the Thor an extremely attractive package.

The Thor range is now available from:

dansoft

DANSOFT
Dronningensgade 15
1420 Kobenhavn K
DENMARK
Tel: (01) 57 84 00
(01) 57 82 02

KOMIN
De Greefstraat 15a
5622 GJ Eindhoven
NETHERLANDS
Tel: (040) 45 66 60

futura datasenter a.s.

FUTURA DATASENTER A.S.
5582 Olensvag
NORWAY
Tel: (04) 76 89 28

S.P.E.M.
Via Ponchielli 26/C
10154 Torino
ITALY
Tel: (011) 85 65 19

PSITRONIC AB

PSITRONIC AB
Box 3094
400 10 Goteborg
SWEDEN
Tel: 31 12 83 80
31 13 40 12

curry computer

CURRY COMPUTER
P.O. Box 5607
Glendale
Arizona 85312 5607
U.S.A.
Tel: 602 978 2902

Next Month: Thor Presentation in Denmark at British Embassy

Service Contracts

All Thor computers include a full six month warranty and support service. This may be extended to twelve months at the time of purchase for £50 (ex VAT). Thereafter, additional 12 month service contracts are available at £100 for Winchester models and £75 for all other models.

The service contract gives a repair (or replacement) service including delivery and collection within the UK. Also included is a software support service and a free annual update of Psion Xchange and other software packages.

Microdrives for the Thor!

Due to popular demand, CST are now offering an external microdrive option for the Thor allowing easy transfer of a wide range of QL format software.

This option gives the ability to run protected microdrive software which require the presence of a microdrive "key" to run, even though the program may be loaded from disc.

The option costs £34.50 (inc VAT) when ordered with the Thor. For full details contact CST on (0438) 352150.

SOFTWARE FILE

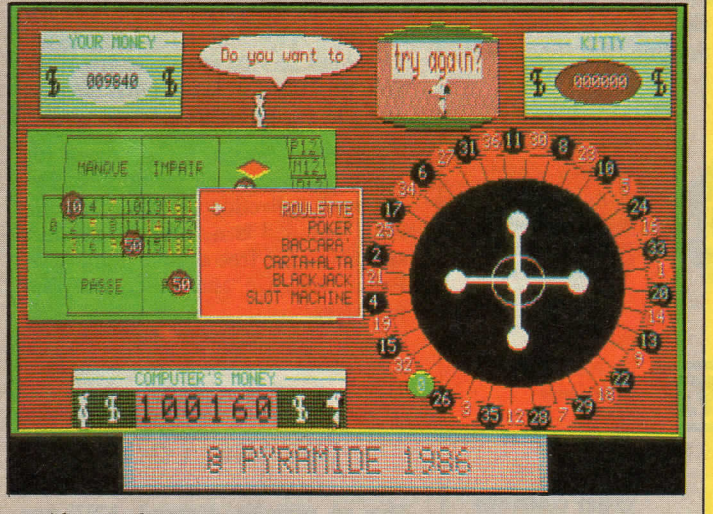
Ken McMahon tries his hand at gambling games and reviews a futuristic arcade adventure.

Super Croupier

Pyramide
£15.95

Pyramide is a company that in a relatively short period has developed a reputation for producing QL software of high quality. Super Croupier is the latest addition to a long list of titles, both games and utilities, that the company has released in the past year.

A gamblers compendium, the package contains just about every type of casino game imaginable; Roulette, Blackjack, Baccarat, Carta + Alta, Poker and slot machine. The games are selected from a main menu and a common screen layout is maintained throughout. That means it is possible to switch quickly from one game to another if you get bored.



My high expectations took a bit of a bashing after a few games of Roulette. You start with $10,000 and the computer, which acts as banker, has a reserve of $100,000. There is a $50 house limit. First, using the menu, you must place your bets, all the usual Roulette options are available. There are two characters called Snoopy and Willy present in all the games who ask you to place your bets, tell you how much you have won or lost, and so on.

Lots of other information, possibly too much, is provided on screen. A table shows details of your win/loss record, and occasionally that is given in the form of a chart. Naturally, the Roulette table occupies most of the screen. It is beautifully drawn, but I was extremely disappointed with the wheel — it does not spin. Instead, a white circle spins around the static wheel highlighting each of the numbers in turn before coming to rest.

Roulette is undoubtedly the best of the bunch. The others, with the exception of Slot Machine are all card games. The format is essentially the same. The cards in your hand are depicted on the screen and the computers are displayed face-down. Snoopy and Willy ask how much you want to bet and the game continues in that fashion.

All of the six games suffer from the same drawbacks. The problem is that the screens are badly designed and cluttered. Also, the menus have not been terribly well thought out. After each spin of the Roulette wheel, you are once again presented with the main menu asking which of the six games you want to play. The instructions are inadequate, consisting of bare description of the game. No rules are supplied for any of them so if you do not know how to play - hard luck.

Diehard gamblers will no doubt love it, but I have to say that as far as I am concerned Super Croupier does not match Pyramide's usual very high standards.

Strip Poker

Talent
£14.95

This review is X rated, so if you are under 18 I suggest you turn the page and take a look at utility file. Alternatively, you could cover it up with a piece of paper and read one of the other reviews.

On the assumption that I am now talking to consenting adults only, Srip Poker is a computer version of the card game in which, if you are not lucky, you can literally lose your shirt. You play against Denise, an attractive bundle of pixels in red jeans and a striped T-shirt.

For those unfamiliar with the rules, each player is dealt a five card hand and given the option to start betting or 'ante up'. At this stage you can call it quits if your cards are no good. Having taken the plunge you can then change up to three of your cards in order to improve your chances. The best hand you can hope for is a straight flush — five cards of the same suite in running order. What you are more likely to end up with is a pair — two cards with the same number. If you do not even have a pair, it is probably wise to cut your losses and throw in your cards.

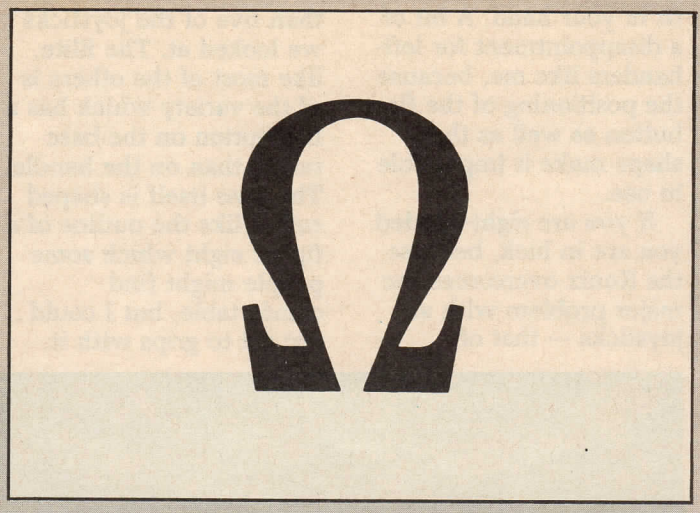
Both you and Denise start with £200. When that runs out, off comes the T-shirt. You are supposed to be a good sport and remove your clothes if you are the unlucky one. Having stripped off, you get another £200 to play with.

If you are unfortunate enough to lose an item of clothing, if you win the subsequent round, you are allowed to put it on again. The best thing to do in that situation is reset the machine and start from scratch. After all, where is the fun in putting your own clothes back on?

The screen is well designed and the graphics are, well, very good

Omega

Caret Computers
£14.95



'The year is 2156. You are a mercenary codenamed Omega and your mission is to seek out and destroy a powerful government computer system hidden deep beneath the ground. It is well defended and you will need exceptional skill and agility to succeed in your task.'

So goes the blurb on the packaging for this enormous 3D arcade adventure from newly formed Caret Computers. The game is in fact so large that it will run only on an expanded QL.

The design of the screen gives the impression that you are sitting at the controls of some kind of vehicle. A 3D view of the outside world is provided by the main window around which is arranged other instrumentation — a direction indicator, energy level meter, radar screen and early warning indicator. A further window in the bottom left provides other information on your status by means of scrolling text.

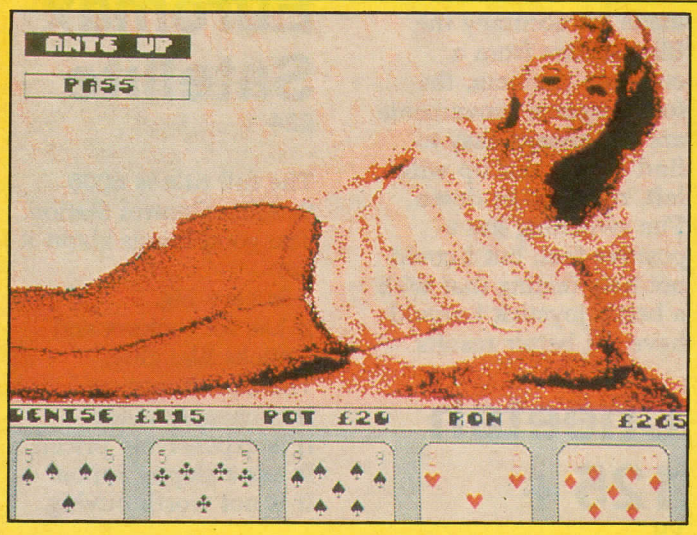
You start out at a crossroads in the middle of nowhere, this is one game where mapping is absolutely essential. If you do not make a map you will find yourself totally lost in a matter of seconds. Movement can be accomplished either by use of the cursor keys or a joystick on the 'turn and move forward' principle.

If your mapping is any good, after a short while, at the end of a T-junction you will discover a large house which you have no choice but to enter. You will be given a password — which is not too difficult to guess — so that you can re-enter the game at this point should something fatal befall you.

One thing I have not yet mentioned is that en route to the house you will encounter nasties in the form of bird-like creatures. Using the gunsight crosshairs which will appear in the viewing window you must gun them down without delay. Every second costs you precious energy and if that runs out you are dead.

The game progresses in much the same fashion, entering a maze, destroying the nasty creatures and finding the doorway to the next. The objective being to find the underground computer and destroy it — I did not get quite that far.

Omega is an enjoyable and challenging game and by far the best of this month's offerings. The one criticism I would make is that each time you move, the screen update is not exactly what you would call instantaneous — it takes a second or two. That, however, is a small price to pay for what is otherwise an excellent game in all respects.



indeed. Most of the screen is occupied by Denise and the cards are displayed along the bottom. Selection is made by directing a pointer using the cursor keys.

During the course of a hand Denise chats to you via speech balloons to let you know what is going on. She says things like 'I ante up what about you', 'Fortune favours fools, I pass', if you are lucky; 'How shall I hold with these cards, you win', and if you are very lucky; 'I'm dead broke, I undress a bit for £200'.

The thought of thousands of pairs of sweaty palms hovering over keyboards in darkened rooms in an attempt to remove the clothes from a digitised female seems to me somewhat sad, if not entirely ludicruous. Having said that I cannot deny that it is amusing.

What Talent has attempted to do, it has done extremely well. Whether you love it, or find the whole idea thoroughly distasteful, you cannot deny it has been well done.

Which Joystick?

You can count the number of QL joysticks available on the fingers of one hand, but with an inexpensive adaptor the chjoice is considerably widened. We check out the options.

Most arcade games, if not impossible to play using the cursor keys, are greatly improved by the use of a joystick. The bad news is, that with the possible exception of the DJW joystick reviewed in the February issue, there is not a single good QL dedicated joystick on the market.

The good news is that there are lots of other joysticks that you can plug into the Ctrl 1 port with the aid of an inexpensive adaptor. We took some of the most popular joysticks available and put them all through a gruelling test on the most physically demanding QL arcade games including QL Karate, Droidzone and Tankbusters. This is how they fared.

Euromax Pro Ace
£10

Micro Ace
£15

On the surface, the only difference between these two joysticks is the colour of the stickers and handles. In use, however, they behave very differently.

The difference lies in the switching mechanism. The Micro Ace uses what Euromax call a 'uniquely constructed bearing and gate assembly'. Unique or not, it works perfectly and allows for super-accurate and very positive control.

The Pro Ace, on the other hand, is horrible. It is stiff, sticky and has a totally dead feel about it. The square symmetrical design of both joysticks means they can be used equally well by right or left-handers.

Suzo Arcade
£19

A little on the expensive side, but sturdily built, the Arcade is similar in design to the Euromax Elite. It is very good at diagonals, because there is a lot of space between the horizontal and vertical switches. There is not very much you can say about this joystick. It feels nice, works well and is built to last.

Konix Speed King
£15

The Speed King is the first and only joystick ergonomically designed to fit in your hand. A bit of a disappointment for left-handers like me, because the positioning of the fire button as well as the shape make it impossible to use.

If you are right-handed you are in luck, because the Konix overcomes the major problem with all joysticks — that of keeping a hold on them when you are under heavy attack and need to execute some severely evasive manoeuvres.

Spectravideo Quickshot Turbo
£15

This is an upgraded version of the best selling Quickshot II joystick. It has two grab patches on the base for secure holding and a fire button on the top. The Turbo, in common with the Cheetah, has an autofire switch. There are those who say it is not a patch on the original, probably because the grip is very stiff. Recommended for body builders.

Euromax Elite
£13

Euromax are prolific producers of joysticks, they manufacture no less than five of the joysticks we looked at. The Elite, like most of the others is of the variety which has a fire button on the base rather than on the handle. The base itself is shaped rather like the outline of a figure eight which some people might find comfortable, but I could not get to grips with it.

Despite the claims made for accuracy the Elite suffers from a common problem, the four diagonal movements are not always easy to find — you end up with left, right, up or down. The switching has a positive feel, but I could not help feeling that with a better joystick I would have got better results.

Cheetah 125 +
£9

This is more my kind of joystick. It has no less than four fire buttons, two on the base and two on the grip. You can stick it on the table with the four plastic suckers located on the base and it actually stays there.

While the Cheetah is very comfortable to use and high on features, it has two drawbacks. There is no positive clicking of the switches, which means that diagonal directions are very difficult — not a joystick for Karate players.

Second, it does not have a very solid feel about it, in other words it is cheap. Whilst it did not show serious signs of deterioration I know from experience that after a couple of hours hard grind these kind of joysticks can, and eventually do fall apart if you are tough on them.

Euromax Satellite
£24

The full title is 6006 Satellite Control Station. The good things about it are:
It is very big.
It has six suckers and sticks like glue.
The bad things:
It is cheaply made.
It is expensively priced.
It has a sloppy action.
It is not worth buying.

Euromax Wiz Card
£6

The Wiz Card is not so much a joystick as a cursor controller. It is a slim card with two fire buttons and a four-way cursor control pad. It is excellent for games where single-step accuracy is required, but not for much else. The fire buttons are positioned below the cursor pad which makes operations a job for a contortionist.

QL EDUCATION...

Until now we have been busy dealing with how to calculate percentages. It is time to start considering a different topic area. After all, computer teaching is not the reserve of the mathematics teacher. In this instalment Leslie Fahidy addresses the problem of teaching spelling by the use of a computer.

As soon as we start thinking about a spelling program, we notice that certain problems continue to arise. The first matter to be settled is how to present the question. Assuming that your QL has no voice output — it cannot speak the word in ordinary English which should be spelt by the student — how do we present the question? One possible solution might be deliberately to misspell a word and ask whether or not the spelling is correct and, if not, what is the correct spelling?

That avenue may certainly be investigated, and the reader is invited to do so, but be warned — there are some nasty problems to be solved on the way.

The important point to grasp is that, unlike with many mathematical problems, in this field we must first decide what we want to do and how. It is also important to realise that the solution is not so simple as it had been previously; generally, when you have a choice it usually leads to complications.

Natural reaction

Let us return to the decision of how to present the question. Did you have the immediate urge to take a pencil and a piece of paper, to jot it down? If you did, that was a perfectly natural reaction; you should have done so. As soon as we have a choice, as soon as the method of solution is not immediately obvious, we must make reasonably detailed plans of how we may achieve our objectives.

Without beating about the bush any further, let me tell you I have started to talk about algorithms. An algorithm is a planned method of solution which takes into account every conceivable contingency, every nasty exception to the rule, and gives us a plan to achieve our aim. There are other important criteria a good algorithm must fulfil but the definition given will be sufficient for our purposes.

So take a piece of paper and start writing the main points of our algorithm:

1. We will adopt the method of jumbling the required word on the screen and presenting it, together with a suitable clue. The student is then required to decipher it and input the correct word. If that is done we go to the next problem. If not, then we must say so, and give the correct solution.
2. Clearly, for the first part of our algorithm to work, we must store a number of words, with their clues, in the computer memory and let the computer choose at random. Inevitably that will lead to some of the words being presented more than once, and some not at all; we must accept that with good grace. If it worries us, we could always store such a large number of words that repetition is unlikely. There are also other ways to avoid repetition.
3. We must discuss the question of how the words will get into the computer memory. There are two possibilities — either with READ . . . DATA statements, or we must put it in and save it to a data file before running the program. The second method is preferable. With READ . . . DATA statements, all the words and their clues forming an integral part of the program, we are limited to just one set of words, while we may save as many data files on our Microdrive cartridge as we like, within reason.
4. We will have to handle one very important problem and it would be just as well to start thinking about its solution at once. It is the problem of lower-case versus capital letters. Some teachers maintain, justifiably, that the spelling of words should be learned with lower-case letters. In spite of this, if a child answers 'Dog' or 'DOG' instead of 'dog', are we to say it is incorrect? Clearly not, but bearing in mind how a computer compares strings, it will not accept that 'Dog' = 'dog'. So we must do something about it. We have to write a procedure which converts both the question and the answer to lower-case letters and it is those converted words which will be used in string comparisons.

Skeleton

The algorithm presented is only a skeleton. We must enlarge on it considerably to make it become really useful. Read through this algorithm — or your own, once you reach the stage of writing your own algorithms — look at every statement and ask if you would be able to translate the statement into your programming language.

There are three possible answers. If the answer is an unqualified yes, you have no problem — read the next statement. When you reach the stage of writing code for your particular computer language, you will be able to convert it without difficulty. If the answer is no, you must break down that statement of the algorithm into smaller steps — if you cannot translate the statement into the programming language you use, expand that portion of the algorithm.

For instance, statement 1 in our algo-

rithm may say jumble the word. There is no instruction in SuperBasic to enable us to translate that requirement directly, so we must break it down. Notice, however, that once you have written a procedure to do the task, called, say, 'JUMBLE', you may use it to achieve the task. So, when talking about algorithms, we are really talking about structure.

The statements of your expanded algorithm could be labelled as 1.01, 1.02, 1.03, and so on.

Finally, if the answer is MAY BE, it is only a question of how far do you trust yourself. This situation is likely to arise when a statement in the algorithm will translate into half-a-dozen or so instructions in SuperBasic. If you have tackled that kind of problem previously, go ahead and write the code for it. Otherwise, explain to yourself through a flowchart, how you will do it.

Flow charts

Another word has crept into our vocabulary — flowchart. I do not propose to go into it in detail but in the next instalment we will be drawing some flowcharts, so you will get the necessary experience.

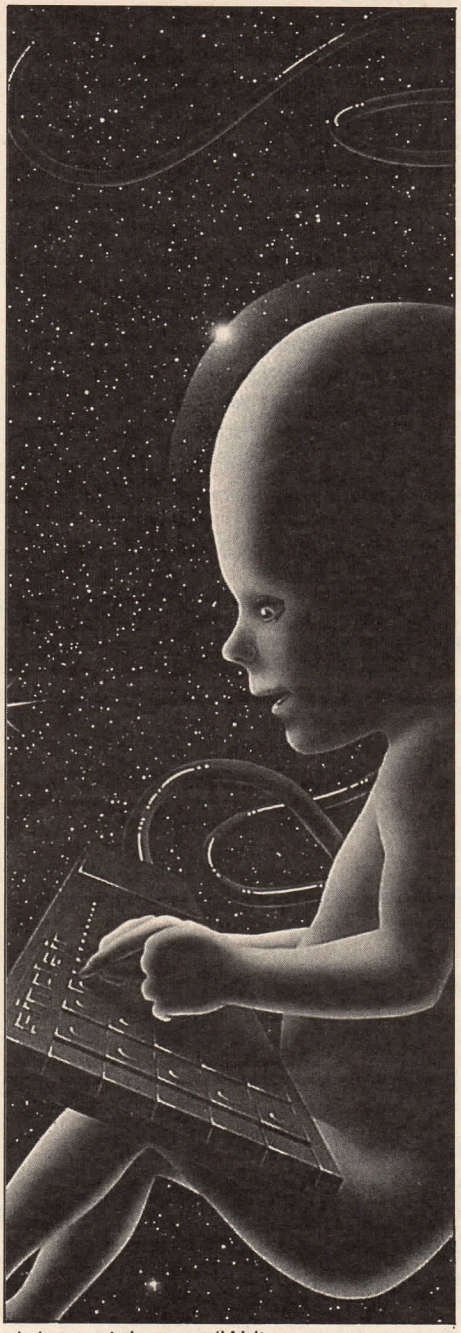
I hope you have noticed how everything in this instalment ties with structure since we spent some time discussing structure in recent months. First, I talked about structuring the learning material in February. In last month's instalment, I told you about the structure of the program. This time, I am telling you that your whole approach must be structured if you want to solve problems beyond the trivial.

Even though I have given you something to think about along the lines of an algorithm for our current problem, and we have discussed some of the issues, I have not yet given you an algorithm. Presently I will give an algorithm for the task of inputting words and their clues and writing this input to a data file. We will discuss this algorithm. Finally, I will give you a program listing for the algorithm.

Here is the algorithm for the input routine:

1. Write messages on-screen and dimension necessary variables.
2. Decide to terminate the input by a 'rogue value'.
3. Input a word.
4. If the word is the rogue, continue at 7.
5. Input the clue to go with the word.
6. Go back to 3.
7. Enter the name and the drive number for a data file, to which the user wants to write the data.
8. Write to the data file:
   total number of words, in a loop;
   each word, followed by a '%' sign, and followed by its clue.
9. Close data file.
10. Exit.

On reading the statements of this algorithm, we find that no statement needs to be expanded, since all of them can be translated directly into a SuperBasic instruction, though expanding a statement is not something of which to be ashamed — if you feel the need for it, do it. For instance,



statement 1 says: 'Write messages on-screen and dimension necessary variables'. I know what messages I want to write on the screen and, having the program already available, I know which variables need to be dimensioned, but if you are in doubt, sketch the screen on a piece of paper and decide, not only what the messages should be, but also where each message should be displayed.

While the break-down of this algorithm is generally not needed, an explanation may not be amiss. The messages in statement 1 refer to the instructions to be given to the user; needless to say they may be constructed in a number of ways. The messages are printed by lines 120 to 150 in this month's listing.

What about dimensioning? In most versions of Basic, and certainly in SuperBasic, string arrays should be dimensioned before they are used. Two string arrays are used in the listing — word$ and clue$.

Since we have plenty of memory available, I decided to dimension each of them for 1,000 elements. That is the largest number of word/clue combinations you may enter with this program. In the unlikely event of you wanting to enter more words, alter line 220 accordingly. When dimensioning strings, you may also specify the length of each element of the array.

Bearing in mind that this is a spelling teacher, unlikely to contain long and complex words, I decided to dimension the length of each word to 15 and each clue to 50 characters. It is most unlikely that you will want to increase those figures but if you do you will have to change line 220 to reflect your wishes.

Rogue value

Statement 2 of the algorithm says terminate input by 'rogue value'. That might need a little explanation. Generally, when we start inputting data, we do not know how many words and clues are waiting to be input. We could count them, of course, but if we then input them in a FOR . . . END FOR loop, we would have to change the program every time there was a different number of data to input.

In situations like this, when you would really like to use a FOR . . . END FOR loop but you do not know how many times, the rogue value method is valuable. We choose an input which could not conceivably occur in context and that is the rogue value.

In our program I have chosen X (or x) for this role and the user is informed. 'If no more input then type X'. Clearly, we shall not ask our candidate how to spell the single-letter word X. Each input is checked by the program and when the rogue occurs the input sequence is terminated. So the program cycles between statements 3 and 6 until the rogue value occurs in the input; action is then transferred to statement 7.

In statement 7, starting at line 1070 in the listing, we ask the user to supply

the name of the data file and later the drive on which it should be located. Strictly speaking that is not necessary but it is useful. In its absence, all data files would have to be saved under the same name and on the same drive — the one selected by the programmer.

Which group?

The present arrangement enables us to input different lists of words and clues — perhaps for different age ranges or ability groups — and use whichever is appropriate. Similarly, in the main program, next month the user will be asked which data file he wishes to use and on which drive.

Possibly some further explanation is needed with respect to statement 8 in the algorithm. You may ask who do we want to record to Microdrive the number of word/clue combinations? So that, when loading that data file, we first load the number of data into a variable, say number, and then we may read all the data with a

```
FOR loop = 1 TO number
INPUT£5, string$:REMark if we used
channel 5
END FOR loop
```

loop. Incidentally, the same result could have been achieved using the EOF (End Of File) function; feel free to choose.

One more point in the algorithm might need clarification. It seems that we are writing each of the words and clues to the data file but each pair is separated by the '%' sign. It could be done in a different way, but it is faster to write one long string to the Microdrive rather than two short ones.

It would be economical on time, therefore, to combine pairs of words and clues into one string — I combined them into spell$ in line 1120 — and write them to the data file together. When reading it back, however, we must know where the words end and the clue begins; that is why I separated the two halves with a '%' sign.

A word of warning. You will often be required to write a sub-program, such as the one we have been considering this month, to enable you to input data for the main program to be written on a different occasion. You can never be sure that the input sub-program works correctly until after you have written the main program and you confirm that it does. I am in the comfortable position of knowing that my input routine works, because I have already written the main part of the program and I know it does. You, I am afraid, will have to wait to next month to see the main body of the program.

```
100 REMark THIS SECTION WRITES DATA TO A DATAFILE.
110 REMark input routine for spelling
120 CLS
130 AT 8,6:PRINT"Enter data as requested."
140 AT 10,4:PRINT"If no more input then type X."
150 AT 15,1:PRINT"Press any key to continue."
160 response$=""
170 REPeat waiting_loop
180  response$=INKEY$
190  IF response$<>"" THEN EXIT waiting_loop
200 END REPeat waiting_loop
210 CLS
220 DIM word$(1000,15),clue$(1000,50)
230 start
240 STOP
1000 DEFine PROCedure start
1010 CLS
1020 FOR input_loop=1 TO 1000
1030  INPUT"Word..";word$(input_loop)
1040  IF word$(input_loop)="x" OR word$(input_loop)="X"
      THEN EXIT input_loop
1050  INPUT"Clue..";clue$(input_loop)
1060 END FOR input_loop
1070 CLS:INPUT"Name of data file..";name$
1075 INPUT"Which drive to use..";drive$
1080 name$="mdv"&drive$&"_"&name$
1090 OPEN_NEW#4,name$
1100 PRINT#4,input_loop-1
1110 FOR printing_loop=1 TO input_loop-1
1120  spell$=word$(printing_loop)&"%"&clue$(printing_loop)
1130  PRINT#4,spell$
1140 END FOR printing_loop
1150 CLOSE#4
1160 END DEFine
```

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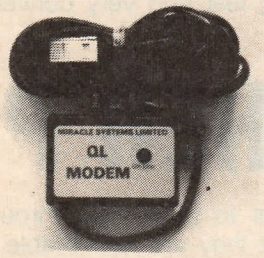

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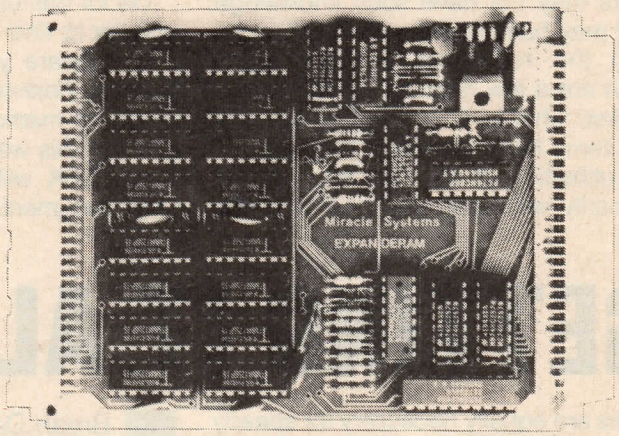

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Software Applications

GETTING IT ALL TOGETHER Pt1

Bryan Davies has taken over the Software Applications list. Over the next few months he will show you how to make a working business system with your QL.

MAKING A SYSTEM OF IT

Those who write programs and have elecronics experience will develop their own ways of making operations with the bundled QL software easier and quicker. Business users may not have such knowledge and may have little time to learn more than the rudiments of SuperBasic. Here are a few hints for such users.

First, what to buy. I regard each of the items listed as being essential for full utilisation of the QL. My work is primarily with Quill but most of these items are equally necessary for speedy manipulation of the other three packages. Mention of particular products does not imply criticism of others — I refer only to those I know.

Hardware
Extra memory (preferably 512K).
Disc drives (dual 3½ in, each 720K formatted capacity).
Disc interface, possibly combined with extra memory.

Firmware
Icon front end, preferably with mouse.
Toolkit, possibly in disc interface.

Software
Key- or icon macros.
Program switching.
Speller.

It is not sensible to give these items an order of importance. Their value varies with the work being done; £15 spent on a switching program can produce as much improvement as £400 on disc drives, in some cases. Suggested sources for the above are:

Memory
MP 256K internal — piggy-back — Eidersoft.
PCML 256K external — Eidersoft — or 512K — Sandy, both with disc interface.

Disc interface
PCML or Sandy, with Toolkit commands — Eidersoft, Sandy.

Disc drives
3½in. Mitsubishi or NEC, ⅓-height — Eidersoft.

Front end
ICE, preferably with mouse — Eidersoft.

Key- or icon macros
KeyDefine — Psientific Software, Transform.
Icicle — Eidersoft.

Program switching
Q_Switch — Transform.

Speller
Qspell — Eidersoft.

Go for the full 640K system. You are unlikely to find a full house too much. The software you buy for instruction macros, desk-top, mouse, will take a portion of memory — expect to lose up to 100K this way. Do not think that an extra 128K will allow you to have a Quill document 128K larger than you can get with your basic system — Quill takes any memory it can get and does not allocate all of it to documents.

Switching programs allow specific amounts of memory to be allocated for data with the Psion programs but you will find that the maximum file sizes you can get before overflow occurs are much less than the allocated spaces.

Expect to allocate 50–100 percent more memory than the size of your document files. External memory or internal? If you are mainly a Psion user, it is unlikely you would be able to notice much difference between the two types. The speed difference may be 10 percent or less in practice. Using the QL for much real computing may make the external add-on memory preferable, though. You cannot tell a program to use only external memory; the QL decides which areas of memory to use and they may not be the fastest.

The decision whether or not to buy disc drives is a similar one to that for extra memory. Your problem may be solved by either memory or discs but the need for discs is more pressing when you use Microdrives a good deal. The latter are a remarkable engineering feat and very convenient if you want to send data through the post, but they are not reliable or fast enough for jobs with a large I/O content and do not have sufficient capacity.

You can effect a big improvement in Microdrive speed by using the Q_Switch program. A comparison of saving times, first with just Quill loaded, then with a Q_Switch routine having Quill as its only job, gave save times for a 5,300-words file of 6½ minutes and 22 seconds, so Microdrives can be fast. The comparable figures to disc were 25 and 17 seconds. Microdrive copying can also be speeded considerably by the RAM-disc program Qflash.

Spot the difference

Interfaces tend to have similar-looking specifications but significantly different performance. One RAM-disc routine may be much faster than another. Older designs use memory chips which are appreciably slower than current types. Extra SuperBasic commands may be supplied in the interface. Buy one which allows disc drives and extra memory to be connected, because you will want them both eventually. A parallel printer port may be helpful, unless you have already bought a serial/parallel converter; even then, it may be worth having the parallel port, because it will usually allow buffering of the output — faster printing — and in case other hardware has to be connected to the serial ports.

Firmware is software stored in such a way that it does not need to be loaded by the user. Having said that,

the various Toolkits available require user actions to load them but they are resident in chips rather than on magnetic media. The user types-in the command which activates the SuperBasic extensions in the toolkit. If you do not program, a toolkit may not offer you much but, if you want to use even one function from a tookit, such as a user-configurable clock, you must buy and activate the whole set; some recent versions allow activation of selected commands.

Of much greater use to the business user are plug-in ROM modules containing desk-top routines. The first such ROM to gain wide acceptance was ICE; it was good in concept and still serves well but it has remained essentially unchanged and other desk-tops have appeared offering more features.

The simplicity and speed of use of ICE still make it possibly the best choice for users having fairly straightforward requirements but those who need more features, and are prepared to spend the necessary menu time to get at them, should consider recent introductions, such as QATS and Taskmaster, both of which offer desk-top functions along with program switching. It is advisable to test drive any program which is an unknown quantity, especially if it sets out to provide all the facilities which were previously available only separately.

Macro merits

A macro program is essential for Psion users. Whether a blind type — Key Define — is preferable to a visual one — Icicle — or not is a matter of individual style and usage. There are a limited number of mnemonic possibilities available from the alphanumeric keys to assist your memory. You can use <ALT+L> for the Quill instruction <Load> but what if you want to load several different documents? Carrying this line further, if you want to deal with files which have long names, there is no way single-key macros will remind you of several of them.

In this situation, icons are preferable; you draw a picture to represent the file/operation and put text with it. I update five Abacus files at infrequent intervals; apart from remembering the file names, I need to be able to Load/Save all five files from/to three devices. It is not possible to identify five files × two commands × three devices simply and effectively with single-key macros, so I use the Icicle program, which allows up to 27 macros with picture/text icons, and a further 27 with just text.

The merit of a key macro program is speed of operation. One master key, typically ALT, and one other key can activate the Psion commands, or enter data. If an icon program with mouse or cursor keys is used for the same operations, you have to move the mouse and press buttons several times, especially if the required icon is not on the first page to appear. Either way, you save a good deal of time and effort compared to calling the same functions by keying them in character by character.

Switch on

Switching routines operate properly only on programs which are started by EXEC_W rather than by LRUN or EXEC. The Psion programs are in this category but difficulty might be encountered if programs such as Editor and ARCHRTM are included in a switching routine, because they start running as soon as they are loaded and do not allow the switching program to return to other programs.

SuperBasic programs cannot be switched, because the QL interpreter chip allows only one of those programs to run at a time but Q_Switch and Taskmaster allow you to return to SuperBasic at any time. Switching routines may occupy only a few K but you can soon find you have run out of memory when you run several programs simultaneously.

MAKING A SYSTEM OF IT

Check switch program features carefully before buying, to make sure that you will be able to do what you want in your system memory. Q_Switch requires 4½K per switching routine and four programs can be tasked by each routine, the only limit to the number of routines in use being system memory. Taskmaster takes about 80K but is a rather different program, providing housekeeping routines as well.

There is not much to say about spelling checking programs — only one is on offer. Qspell has been around for a year or so and has notched sizeable sales. For most users, it will be adequate with its basic dictionary of 25,000 words covering most standard text. It is a pity software suppliers, including the one producing the program, do not make more use of it.

If you use many unusual words, there is a problem; for Microdrive users, it may be as simple as the size of the dictionary reaching the capacity of a cartridge. The basic file takes 63K and that may have increased to 100K by the time you have reached 30,000 words. Around that level, the dictionary seems to become corrupted, especially if the supplied compression routine is utilised.

Do not believe you have no need to check your spelling — you may be able to spell every word correctly but that does not mean you will type them so. Qspell is a good proof reader; all my work is proofed by humans at least twice but Qspell still manages to find a few errors. It cannot be run as a multitasking job, unfortunately.

Information

ICE, Icicle, Qspell, CHOice, Qflash, PCML 256K disc interface, MP 256K internal memory, NEC disc drives
Eidersoft
The Office
Hall Farm
N. Ockendon
Upminster
Essex RM14 3QH.
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Q_Switch, Key Define
Transform Ltd
24 West Oak
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Super Q 512K disc and printer interface
Sandy (U.K.) Ltd
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Tel: 0234 219814

Taskmaster
Sector Software
39 Wray Crescent
Ulnes Walton
Leyland
Lancs.
Tel: 0772 454328

QATS
Cope
3 Langham Mansions
Earls Court Square
London SW5 9UH.

BETTER BASIC

The primitive QL editing suite can be enhanced considerably by a few short procedures. Mike Lloyd shows how.

Commands such as AUTO and DLINE which help programmers to write Basic programs are known collectively as the editing suite. The way in which these commands work, together with the presentation of a program listing on the screen, is known as the editing environment.

Some editing environments are very complex, using icons and transient windows to offer sophisticated facilities. Some computers offer full screen editors which do not use the concept of a command window. Some editing environments, including those of the QL, are very primitive. Conversely, the QL has one of the best Basic dialects of any small computer. QL programmers can tailor many of the existing editing commands to produce an editing environment which more closely meets their personal requirements.

The editing command which most needs improvement is LIST. It is verbose, clumsy and unhelpful. Programs can be listed in their entirety by entering LIST without parameters, perhaps pausing in the listing by using the CTRL-F5 key combination. With long programs containing hundreds of lines this is unworkable, therefore LIST can be followed by parameters to declare which lines of the program are to be displayed. For example,

LIST 500 TO 599

lists all program lines between line 500 and line 599 inclusive. While useful, this command involves no fewer than 15 keypresses and other examples can comprise up to 19 characters.

If a programmer was hunting for a particular area of a program, LIST would have to be used repeatedly with a series of different parameters until the correct part of the program was found.

An alternative strategy is to use LIST in a user-defined procedure which has a single character name and which takes only one parameter, thus reducing the typing required to an absolute minimum. The procedure — see listing one — constructs and implements a suitable LIST command based on the single parameter.

Listing 1

```
100 DEFine PROCedure l (x)
110 CLS#2
120 PRINT#2,"SEGMENT" !x \\
130 LIST x*100+(x=0) TO x*100+99
140 GO TO 32767
150 END DEFine l
```

The procedure is fairly unremarkable in its construction but dramatic in its impact on programming techniques. The parameter represents the line number at which listing will begin. Because large line numbers will tend to be used as a matter of course and because listings could easily start at a round hundred, the parameter is the start line number divided by 100. The end line number is found by adding 99 to the start line number. This means that to duplicate the 15-character LIST command the following command, only three keypresses long, is required:

L 5

The construction of the LIST command in the

Listing 2

```
200 DEFine PROCedure lp
210 LOCal x
220 CLS#2
230 PRINT#2; "PROGRAM SEGMENTS" \\
240 FOR x=1 TO 50: LIST x*100
250 END DEFine lp
```

Listing 3

```
300 REMark File Renumber Utility
302 CLS#0
304 d$ = "mdv1_"
306 PRINT#0; "Create Renumbered Basic File"
308 INPUT#0; "Enter SOURCE name: " &d$; f$
310 OPEN_NEW#3, d$ &f$ &"_tmp"
312 OPEN_IN#4, d$ &f$
314 INPUT#0; "Enter START LINE number:"!count%
316 AT#0, 0,0: CLS#0,4
318 PRINT#0; "Copying line..."
320 REPeat loop
322   IF EOF(#4) THEN EXIT loop
324   INPUT#4, a$
326   gap = " " INSTR a$
328   AT#0, 0,16: PRINT#0, a$(1 TO gap),
330   IF a$(gap+1 TO gap+6) = "DEFine"
332     count% = (count% DIV 100 +1) *100
334     ELSE : count% = count% +5
336   END IF
338   a$ = count% & a$(gap TO)
340   PRINT#3, a$
342 END REPeat loop
344 CLOSE#3: CLOSE#4
346 DELETE d$ &f$
348 COPY d$ &f$ &"_tmp" TO d$ &f$
350 DELETE d$ &f$ &"_tmp"
352 PRINT#0; "Final line = "; count%
354 STOP
```

Listing 4

```
400 DEFine PROCedure c8
410 WINDOW    448, 200,  32,  16
420 WINDOW#0,448,  40,  32, 216
430 WINDOW#2,448, 200,  32,  16
440 PAPER     2: INK     7
450 PAPER#0,  0: INK#0,  7
460 PAPER#2,  1: INK#2,  7
470 MODE 8
480 END DEFine c8
```

procedure is made slightly more complicated by the need to avoid listing line zero. If the command L 0 is entered, the listing is made to begin at line 1.

There is a further complication imposed by Qdos because it does not like some commands, including most of the editing suite, being used within procedure definitions. If a program were halted while a procedure or function was being interpreted and then a listing obtained

Listing 5

```
500 DEFine PROCedure c4
510 WINDOW    256, 202, 256,   0
520 WINDOW#0, 512,  50,   0, 206
530 WINDOW#2, 256, 202,   0,   0
540 BORDER    1, 246: PAPER    2: INK    7
550 BORDER#0,       0: PAPER#0, 0: INK#0, 4
560 BORDER#2, 1, 246: PAPER#2, 7: INK#2, 2
570 MODE 4
580 END DEFine c4
```

using the L procedure, an attempt to edit a line would produce the error message "not implemented". Repeating the command would clear the problem and the required line would be displayed in the command window as normal.

To eradicate this annoying foible it is necessary to commit a heinous sin in structured programming terms, and that is to use GOTO, which alone is bad enough, to jump out of a procedure definition, which is usually unforgiveable. By directing program flow to the last line of a program, Qdos is confused into thinking that it is not working with a procedure definition and therefore the EDIT command can be used without difficulty.

The procedure begins by clearing the listing window and printing a short message to indicate what is being displayed. Further embellishments could be included, for example to set border and paper colours.

In effect, this procedure introduces the concept of dividing listings into segments which can be imagined as pages. Page 1 of a listing would contain line numbers from 100 to 199 inclusive, page 7 would contain lines 700 to 799, and so on. This is a useful improvement on LIST but scarcely provides the dramatic impact on programming habits promised.

If each page contained a single procedure or function definition it would encourage the use of procedures and functions as a matter of course; it would improve their readability by showing just one procedure or function at a time and it would be easier to find one's way around lengthy programs.

Listing two takes advantage of the paging concept to produce a list of all the procedure and function definitions in a program by listing each line number divisible exactly by 100. Entering the procedure name — lp is short for List Procedures — produces output similar to this:

```
100 DEFine PROCedure l
(x)
200 DEFine PROCedure
lp
300 REM main body
400 DEFine FuNction test
(x, var$, value)
500 DEFine PROCedure
quit
```

The procedure depends on the program being numbered appropriately initially. With a little care when choosing line numbers time will never again be wasted in long searches for a particular definition or in typing verbose LIST commands.

The third listing is a utility which can be used to re-number existing programs into 'pages' but it is of value only if programs are properly structured by using user-defined procedures and functions. RESTORE commands will need to be re-numbered by hand. GOTOs and GOSUBs are also not re-numbered, but they have no business to be in a structured SuperBasic program.

Finally, a further enhancement of the QL programming environment can be achieved by changing the position and sizes of windows. SuperBasic lines tend to be short, especially where multi-line versions of control structures are used. The listing window is therefore best arranged to be as long as possible but not necessarily as wide as its default setting. It is also helpful to have a procedure which restores window settings if they are changed in a program.

Listings four and five are procedures which set the screen windows to their default settings in TV mode and monitor mode respectively. The procedures are called C8 and C4, referring to the number of colours available in each mode.

Listing six, C0, is a revised setting of the default windows in Monitor mode to make better use of the screen. The listing window is 37 characters wide — the same as the default width in TV mode — but a useful 25 lines deep. The main window is of identical proportions to the default TV mode setting, allowing graphics to be displayed as they would appear in a program running in TV mode. The remaining area is used by the command window. Because it is much deeper than normal, commands remain in the window for longer than usual.

The procedures are best used by saving them in a file, perhaps a BOOT file, and merging them with programs undergoing development. As with all utility listings, the procedures should be re-numbered with high line numbers to avoid conflicts with other program lines.

Other possibilities should suggest themselves to amend or supplement these procedures to overcome the shortcomings of the existing editing environment and make it equal the power of SuperBasic. The main considerations should be to reduce typing to a minimum and to provide helpful facilities using as little memory as possible.

Listing 6

```
600 DEFine PROCedure c0
610 WINDOW    284, 126, 228,   0
620 WINDOW#0, 284, 115, 228, 126
630 WINDOW#2, 232, 256,   0,   0
640 BORDER    2, 0: PAPER    2: INK    7
650 BORDER#0, 2, 0: PAPER#0, 4: INK#0, 0
660 BORDER#2, 2, 0: PAPER#2, 7: INK#2, 2
670 MODE 4
680 END DEFine c0
```

● *Next month's article continues this theme with some file access routines.*

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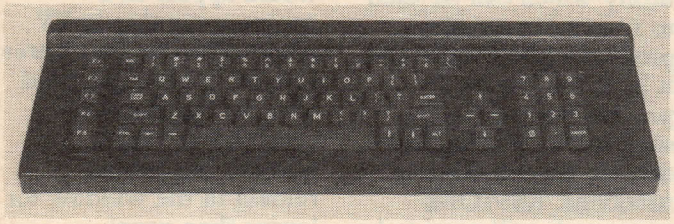

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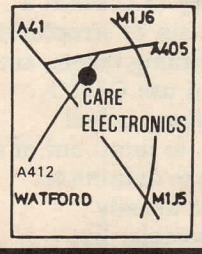

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Ram Packed

SOFTWARE RELEASE

QRAM is a menu-orientated modular front-end system. Ron Massey describes exactly what that means.

Released somewhat later than anticipated, *QRAM* utilies from QJump have finally arrived. Supplied in a much expanded form, QRAM now consists of a suite of programs supporting the main windowing and controller utility.

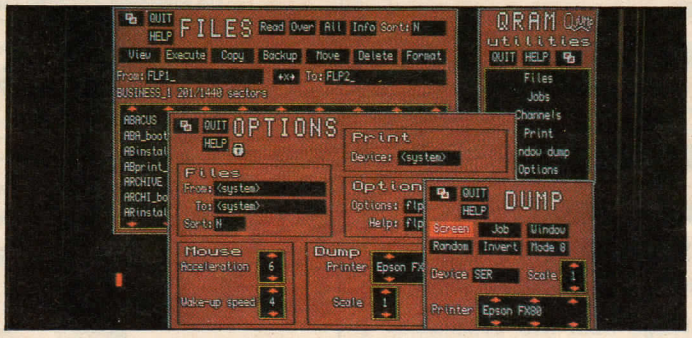
A menu-orientated, modular front-end system, QRAM incorporates six main menus, with additional sub-menus for controlling the QL operating environment. Option selection may be made from the keyboard using cursor keys and <SPACE> bar to select menu icons and directory items, by using the first letter of the word in any of the command boxes or by using any of the hotkeys such as <ESC> <F1> and others to choose particular functions.

QRAM also supports its own mouse system, also available as an in-bulit feature of the new Sandy *Super-Q-Board,* with which cursor movement is impressive. Users not having the mouse system can use the pointer controller file supplied with QRAM.

Each main menu offers the options of QUIT, closing that particular menu; HELP, and an over-lapping window-icon which, when selected, allows the current menu to be moved elsewhere on screen.

When more than one menu is present on-screen, the cursor over the most recently-called menu is indicated as an arrow. Moving over any previously-called menus still on-screen, the cursor is indicated as a lock. If <SPACE> — or mouse button — is pressed with the lock-cursor over a menu, that menu is brought forward and becomes the current menu.

Although a highly-complex program internally, QRAM has a well-designed user interface, without sacrificing any of its inherent versatility. Pressing the default hotkey, <ALT> </>, calls the QRAM Main menu for Files, Jobs, System Channels, Print Spooler, Window Dump or Default Options.



Multiple menus with QRAM.

Selecting "OPTIONS" first offers the opportunity to change System Defaults for drives, printer ports, file display sorting order, printer driver and dump scale. Once satisfied with the default settings, selecting QUIT closes the menu. Pressing the QRAM HOTKEY again returns you to the Main menu.

Filing is what computers are about and the QRAM file processing capability is exceptionally comprehensive. Selecting "FILES" from the Main menu provides a complete range of file-handling commands consistent with Toolkit II.

Access is made to both drives and, where a medium is present in either or both, the menu lists the directory — according to the Sort Order — of the source drive by filename, size, date, time and whether they are Executable or not, with the statistics of the destination drive below its ident box. Drives can be disc, RAM disc or Microdrive. Wild-card entries, as used with Toolkit II, are fully-supported.

If the symbol separating the source and destination ident boxes is selected, the source and destination drives are transposed and the file window shows details of the files from the transposed drive. The directory list may be scrolled, temporarily re-sorted, all or individual entries which are highlighted may be selected, for further processing.

Selecting the VIEW option, a second window is opened over the FILES menu. Each of the selected files, in turn, is presented in the VIEW window. Options are available to view the file in truncated form, the default, or, by selecting the WRAP command, file lines are shown in their entirety. Document viewing is control led by menu selection of Line,Page,Repeat, or Next document in the queue.

The QRAM HOTKEY facility can be used with any pure executable program to produce "pop-up" applications. As of this writing, Qliberated programs are the only compiled programs which will work with QRAM.

Other QRAM features include Microdrive emulation, a background printer spooler and a reasonably good screen dump, supporting 11 monochrome and colour printers, each of which can be set to produce a dump at two or three scales.

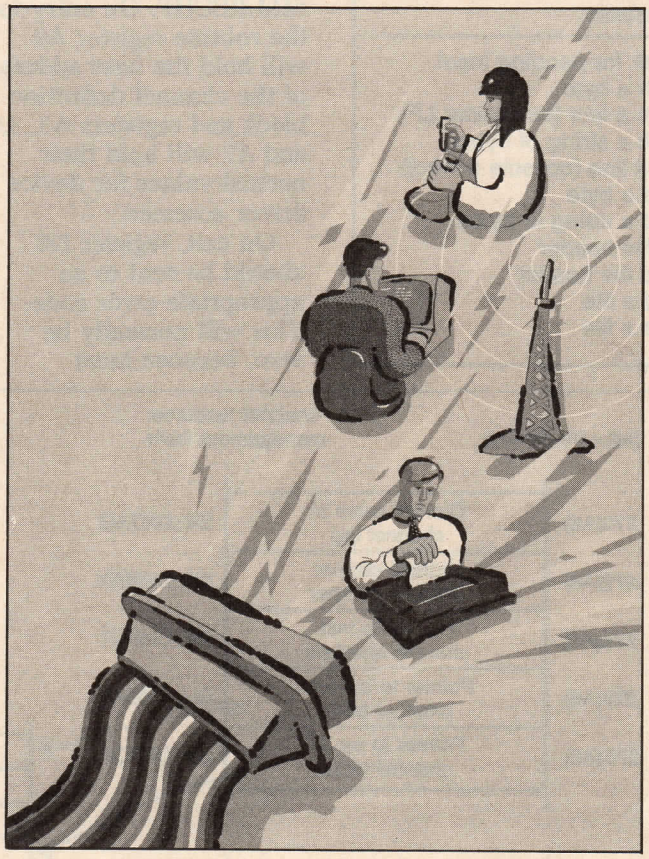
QRAM, also the intended front-end for the Sandy *Futura,* will run only on expanded QLs. Files connected to the QRAM system are more than 45K in length, not including dataspace or elbow room requirements, once up and running.

This superb utility is what is euphemistically referred to as "still under development". QJUMP offers current QRAM users the opportunity of obtaining upgrades as and when they become available.

One of the major additions planned for future releases is user access of the window routines used by QRAM. Other useful improvements will be an option to select screen dump density, alter menu sizes and many more. I would also like to see the option of printing whole or selected file directories.

QL CONNEXIONS

Colin Opie continues our in-depth interfacing project by looking at supporting file structures and directories.



Having begun to look at device driver specifications for simple devices which cannot cater for directory and file structures, in the fifth part of the series we finish our discussion of those drivers and then start to look at drivers which can support file structures and directories — e.g., RAM and floppy discs.

At various points reference will be made to certain Qdos 'TRAP' calls, i.e., the normal Qdos operating system calls. If you need a full description of any of them, refer to *QL Assembly Language Programming* published by McGraw-Hill (U.K.). Writing device drivers and other advanced input/output code requires knowledge of more dedicated Qdos calls. They will be dealt with in a future part of the series.

If all that seems heavy going, do not worry for now. Soon we will be moving to our first Qontrol II input/output board. It contains a ROM which supplies you with extensions to SuperBasic to give you a Control-SuperBasic. If you never want to write your own device driver and want only to control programs in Basic, this is the board for you. In any event, the input/output board will be of use because of its potential. We will also be looking at how the ROM was written, so that those who do want to design boards will have a concrete — well silicon, anyway — example of how to do it. All this preliminary theory will then come to life.

We saw in part four there are three fundamental access layer calls for standard device drivers. There is one call for data I/O, one for channel opening, and one for channel closing. Let us look at each of the calls in more detail to see how we might write our access layer code. All access layer calls are in supervisor mode.

Channel Open

On entry to this access layer code the following registers will be set, in addition to the normal settings for A3, A6 and A7:

A0 Pointer to supplied device name
D3 Key giving 'open' access code (refer: TRAP #2, IO.OPEN)

All channels are implicitly bi-directional and, therefore, it is for the device driver to trap illegal access codes — e.g., OPEN_IN from a Centronics-compatible printer device.

Four common errors should be checked for and returned to D0 (long-word) if they arise. ERR.0M (-3) indicates that there was not sufficient memory to allocate space for a new channel definition block. ERR.NF (-7) will indicate that the supplied device name was not recommended. ERR.IU (-9) indicates that the device is in use and may not be shared, and ERR.BN (-12) will indicate that the device name was correct but the parameter list was illegal. If an error is found, the channel should not be opened. If no error is detected, D0 must be returned to zero and the order of operations performed by an open channel routine will be:

a) Decode the device name — see utility IO.NAME later.
b) Allocate space for channel definition block in common heap area — see utility MM.ALCHP later.
c) Initialise channel definition block workspace, i.e., from offset $18 onwards.
d) Return base address of channel definition block in register A0, and error code zero in register D0.

Data I/O

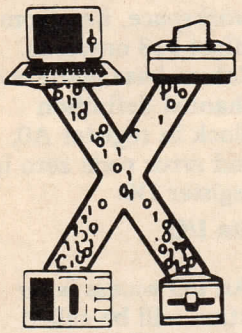
An I/O access layer routine will be called when an I/O TRAP to the appropriate channel is executed. The layer will be called initially at the time of the I/O TRAP call. If the operation cannot complete on the first call, an attempt will be made to call the access layer routine on every scheduler loop. That will continue until the operation is complete or it times out.

All channels are implicitly bi-directional and, therefore, it is for the device driver to trap illegal operations — e.g., input from a Centronics-compatible printer driver. The I/O TRAP #3 calls which may be supported by a standard device driver are shown overleaf.

CONNEXIONS

Handler	Code	Description
IO.PEND	$00	Check for pending input
IO.FBYTE	$01	Fetch a byte
IO.FLINE	$02	Fetch a line (terminator LF)
IO.FSTRG	$03	Fetch a string of bytes
IO.EDLIN	$04	Edit a line (console control)
IO.SBYTE	$05	Send a byte
IO.SSTRG	$07	Send a string of bytes
FS.HEADS	$46	Set file header
FS.HEADR	$47	Read file header
FS.LOAD	$48	Load a file
FS.SAVE	$49	Save a file

On entry to this access layer I/O code register D0 will contain one of the TRAP codes shown. Appropriate additional information will be in registers D1, D2, D3, A1 and A2. Registers A3, A6 and A7 will contain their standard values for device



driver accesses. Register A0 will contain the base address of the channel definition block.

On exit, registers D1 and A1 should be set accordingly — refer to appropriate descriptions of the TRAP #3 I/O calls. The I/O sub-system (IOSS) will maintain the returned values in D1 and A1 and use the original values for D0, D2, and A2 between scheduler loop calls if such calls need to occur. Note that the time out register (D3) will contain zero on the first call and −1 on all possible subsequent calls. Register D0 should be returned with an appropriate error code.

Channel Close

The channel close routine is relatively simple and needs only to ensure that everything is tidied before releasing the space occupied by the channel definition block — by using the utility MM.RECHP. On entry to the routine register A0 will hold the base address of the channel definition block and registers A3, A6 and A7 will hold their normal values for device driver accesses.

On exit, register D0 should be sent to an appropriate error code. This will normally be zero, because most operations will be assumed not to be able to fail. If the close operation cannot be completed because some I/O operation is still going on in the scheduler loop system, the channel definition block may be left alone and released at some later time during a scheduler loop call to the driver. In the latter case it will be the programmer's responsibility to close the channel once the I/O operation is complete. The IOSS will not remind you.

Essentially, the physical

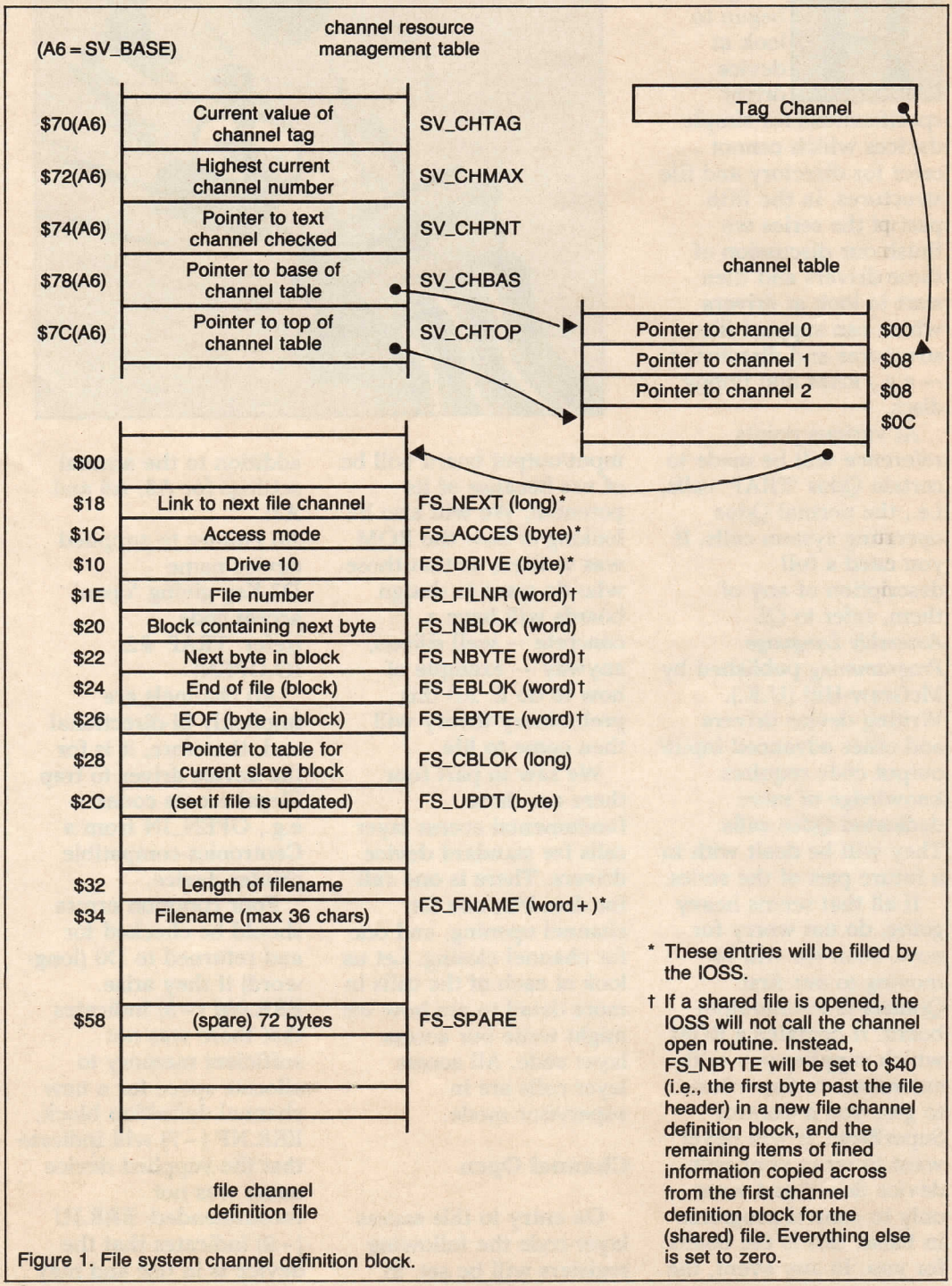
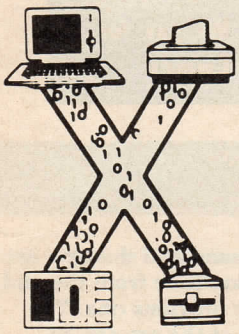


Figure 1. File system channel definition block.

layer code of a device driver is used to manipulate I/O control operations asynchronously with a job requiring that I/O. Data may be buffered — e.g., queued and de-queued — external interrupts



serviced, and so on. There are three types of physical layer access and we now look at each in detail to see how we might write our physical layer code. All physical layer calls are in supervisor mode and they may disable interrupts.

External interrupts

An external interrupt service routine must check its related hardware to see if the interrupt was intended for itself. If not, the service routine can terminate with a return (RTS). If the interrupt is found to relate to the service routine, the routine should perform the required operations, clear the interrupt source, and then return — RTS, not RTE. Memory may not be allocated or released to Qdos by an interrupt service routine.

50Hz/60Hz interrupts

This interrupt should be used only for critical timing operations which take a minimal time to execute. Memory may not be allocated or released to Qdos by a 50/60Hz interrupt service routine.

Scheduler loop

The scheduler loop calls are used to complete I/O access layer operations. They do not interrupt atomic operations and memory can, therefore, safely be allocated or released.

Any errors which may occur in the physical layer normally are dealt with by setting an appropriate flag in the channel definition block workspace area — somewhere after offset $18. The access layer calls would then be written to check this error flag and react sensibly.

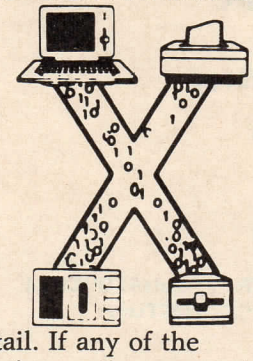
Alternatively, the utilities UT.ERR (vector $CC) or UT.MTEXT (vector $D0) may be called with A0 set to zero. An attempt will be made to write a message to channel 0 or, failing that, to channel 1. If both channels 0 and 1 are awaiting input, the message will be prevented from appearing. Other circumstances within Qdos may also prevent the message being displayed.

That concludes the discussion of non-directory device drivers. We now finish this part of the series by looking initially at directory device drivers. Three definition blocks are required for directory device drivers.

First, there is the directory device driver definition block. It must be set up at the initialisation stage of the device driver. Second, there is the channel definition block. There will be one channel definition block for every channel opened. Third, there is the physical definition block. There will be one physical definition block for each drive. Both the channel definition block and the physical definition block will be allocated by the IOSS.

Embodied in the directory device driver definition block are the interrupt and service loop physical layer links, the I/O access layer links, and general workspace. The physical layer interrupt and service links will be set, if required for the driver, by setting-up the addresses for the driver service routines in question — at offsets $04, $0C, and $14 — and then using the TRAP #1 calls MT.LXINT (D0=$1A), MT.LPOLL (D0=$1C), and MT.LSCHD (D0=$1E) to link the service routines into Qdos.

Later we will cover those TRAP #1 calls in



detail. If any of the service routines are not to be made available to the driver we can leave the service addresses as zero and fail to link them into Qdos.

The access layer links are set up by setting the addresses for the access layer I/O operations — at offsets $1C, $20, $24, $28, $34, $38 and $3C) — and then using the TRAP #1 call MT.LDD (D0=$22) to link the directory device driver definition block into Qdos. The directory device driver definition block is, therefore, an extended form of the standard device driver definition block, and it has the following format:

Offset (A3)	Use
	Physical layer links
$00	Link to next external interrupt routine
$04	Address of external interrupt routine
$08	Link to next 50/60Hz interrupt routine
$0C	Address of 50/60Hz interrupt routine
$10	Link to next scheduler loop routine
$14	Address of scheduler loop routine
	Access layer links
$18	Link to access layer of next device driver
$1C	Address of data I/O routine
$20	Address of channel open routine
$24	Address of channel close routine
$28	Address of entry for forced slaving
$2C	Reserved
$30	Reserved
$34	Address of format routine
$38	Length of physical definition block
$3C	Length of drive name (word)
$3E	<drive name, padded by zero if necessary, in upper case>
	Physical driver working space
$xx	<as required>

In all other respects the directory driver definition block is similar to the standard device driver version.

The channel definition block for a directory device driver is well specified, as shown in figure one, and is set up by the IOSS. The size of the entire block is 160 ($A0) bytes.

Note that there are still 24 ($18) bytes of reserved space at the top of the channel definition block and that there are 72 ($48) bytes of space workspace available for your use, if required, at the bottom of the block.

The items marked with an asterisk will be initialised by the IOSS after the block has been allocated space by the IOSS. All remaining bytes in the channel definition block will be zero.

More will be said of this definition block, and the physical definition block at which we will look next, in the discussion on the directory driver access layer channel open routine next month.

THE P·R·O·G·S

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3D DESIGNER — J F TYDEMAN CONTINUED

This is the second part of 3D Designer continued from the March issue. The program allows you to produce screen pictures incorporating 3D elements.

The commands, which we described in the last issue can be accessed by single key entry. The program also features a number of 3D graphics routines which are described below.

Block routine — key B.

This routine produces a cube which can be manipulated by width, height, depth, colour; and may be inclined at any angle. The graphic may then be moved, confirmed, or painted.

Triangle routine — key T.

All the commands and facilities available in the Block routine are available in Triangle. Also, Turn inverts the triangle.

Curve routine — key C.

This has the same facilities as the previous two routines. Turn changes the curvature of the arc.

Ribbon routine — key R.

The Ribbon routine simulates a 3D effect by drawing a series of arcs, perspective is not parallax corrected. To start a new line, using the curor keys, move the end of the arc to the position required for the beginning of the new line. Press E for the End command and the new arc will continue from the end of the previous one. The angle of the arc can be adjusted as required.

With 3D Designer you should have few problems creating interesting screen. If you are stuck of ideas take a look at our screen design competition winners in the September '86 issue. Finally, if you want a hard copy of your efforts, the menu enables use of the Psion printer dump incorporate with Easel.

CONTINUED FROM MARCH '87 ISSUE

```
236 IF comma=3:AT£0,0,0:PRINT£0;"    (P)AINT : (E)RASE : LOC= ";INT(co);"/";INT(r
o);" ":AT£0,1,0:PRINT£0;"    FILES(F1) :  ARC1(Z/X) :  ARC2(J/K)"
237 END DEFine panel20
238 DEFine PROCedure darc
239 CLS£0
240 REPeat cu
241 inpu2:INK£0,7:PAPER£0,2
242 panel20
243 IF void=0:GO TO 245
244 OVER pain:cub4
245 b$=INKEY$(-1)
246 avoid
247 IF void=0:GO TO 249
248 OVER pain:cub4
249 IF b$="c":color:OVER 1:cub4:OVER 1
250 IF b$="q":OVER 0:CLS£0:RETurn
251 END REPeat cu
252 FILL 0:conv2
253 END DEFine darc
254 DEFine PROCedure cub4
255 FILL 0:color
256 IF solid=3
257  INK scol:ARC co+w,ro TO co+w,ro+z,dev:LINE co+w+incl,ro+z TO co1+w1,ro1+z1:
ARC co1+w1,ro1+z1 TO co1+w1,ro1,-dev:LINE co1+w1,ro1 TO co+w,ro:FILL 0:color
258 INK scol:ARC co,ro TO co,ro+z,dev1:LINE co,ro+z TO co1,ro1+z1:ARC co1,ro1+z1
 TO co1,ro1,-dev1:LINE co1,ro1 TO co,ro:FILL 0:color
259 INK tcol:LINE co,ro TO co1,ro1 TO co1+w1,ro1 TO co+w,ro TO co,ro:FILL 0:colo
r
260 END IF
261 INK fcol:ARC co,ro TO co,ro+z,dev1:LINE co,ro+z TO co+w,ro+z:ARC co+w,ro+z T
O co+w,ro,-dev:LINE co+w,ro TO co,ro:FILL 0:color
262 END DEFine cub4
263 DEFine PROCedure chocol
264 inch=inc:inc=1:PAPER£0,0:CLS£0
265 REPeat choic
266 PAPER£2,in:IF in>=0 AND in<=255:CLS£0:AT£0,0,14:PRINT£0;"    Select Colour
(?)"
```

```
267 IF in>=0 AND in<=255:AT£0,1,14:PRINT£0;"    Step(0-9)  (C)onfirm"
268 AT£0,2,14:PRINT £0;"    <: VALUE:  ";in;"   ":CLS£2
269 cho$=INKEY$(-1)
270 IF CODE(cho$)=216:in=in-inc
271 IF CODE(cho$)=208:in=in+inc
272 IF in<0:in=255
273 IF in>255:in=0
274 IF cho$="c":EXIT choic
275 b$=cho$:incre
276 END REPeat choic
277 INK£1,in:inc=inch:PAPER£0,2:INK£0,7:CLS£0:PAPER£2,2:CLS£2
278 END DEFine chocol
279 DEFine PROCedure chodep
280 value=low
281 REPeat choic
282 IF value<=high AND value>=low:CLS£0:AT £0,0,0:PRINT£0;"  Select Value (>?) S
tep(0-9)  (C)onfirm "
283 AT£0,1,0:PRINT£0;"  CURRENT VALUE: ";value;"   ":cho$=INKEY$(-1)
284 IF CODE(cho$)=216:value=value-inc
285 IF CODE(cho$)=208:value=value+inc
286 IF value>high:value=low
287 IF value<low:value=high
288 IF cho$="c":EXIT choic
289 b$=cho$:incre
290 END REPeat choic
291 PAPER£0,2:INK£0,0:CLS£0
292 END DEFine chodep
293 DEFine PROCedure deviate
294  paus:hol$=hor$:pe$=per$:persp:bep
295  IF pe$<> per$ OR hol$<> hor$ THEN IF per$="l" AND hor$="u" OR per$="r" AND
hor$="d":dev2=dev:dev=dev1:dev1=dev2:END IF
296 IF pe$<> per$ OR hol$<> hor$ THEN IF per$="r" AND hor$="u" OR per$="l" AND h
or$="d":dev2=dev:dev=dev1:dev1=dev2:END IF
297  IF pe$<>per$ AND hol$<>hor$ THEN IF per$="l" AND hor$="u" OR per$="r" AND h
or$="d":dev2=dev:dev=dev1:dev1=dev2:END IF
298 IF pe$<>per$ AND hol$<>hor$ THEN IF per$="r" AND hor$="u" OR per$="l" AND ho
r$="d":dev2=dev:dev=dev1:dev1=dev2:END IF
299 END DEFine deviate
300 DEFine PROCedure Files
301 CLS£0
302 REPeat option
303 AT£0,1,0:PRINT£0;"  (M)ind    (G)et    (S)ave    (L)oad              (V)iew
 (C)ls   (Q)uit"
304 : a$=INKEY$(-1)
305 IF a$="m" :PAPER£0,0:CLS£0:DELETE mdv1_mind:SBYTES mdv1_mind,131072,32768:PA
PER£0,2:CLS£0:RETurn
306 IF a$="g":LBYTES mdv1_mind,131072:CLS£0:RETurn
307 IF a$="s":trap:PAPER£0,2:CLS£0
308 IF a$="l":trap1
309 IF a$="v":PAPER£0,0:CLS£0:PAUSE:PAPER£0,2:CLS£0
310 IF a$="c"
311 CLS£0
312 PRINT£0;"    SELECT MODE (4/8) ":high=8:low=4:inc=4:PAUSE 50:chodep:mo=value
313 IF mo=4 OR mo=8:MODE mo:ELSE :GO TO 311:END IF
314 CSIZE£0,2,0:CLS£0:INK£0,7:PRINT£0;"    Paper colour?":PAUSE 50:hold=in:choco
l:PAPER in:in=hold:INK in:CLS£1:CLS£0
315 END IF
316 IF a$="q":RETurn :END IF
317 :INK£0,7:PAPER£0,2:CLS£0
318 END REPeat option
319 END DEFine Files
320 DEFine PROCedure blank
321 CLS£0:hold=in:PRINT£0;"Colour of Panel?":PAUSE 50:chocol:in=hold:CLS£0
322 END DEFine blank
323 DEFine PROCedure trap
324 CLS£0
325 INPUT£0;"    Name?. WITH DEVICE NAME e.g.mdv2_          (Q)uit  ";name$
326 IF name$="q":RETurn
327 PAPER£0,0:CLS£0
328 SBYTES name$,131072,32768:RETurn
329 GO TO 324
330 END DEFine trap
331 DEFine PROCedure trap1
332 CLS£0
334 CLS£0:PAPER£1,0:CLS£1:DIR mdv2_
```

THE P+R:O=G<S CONT.

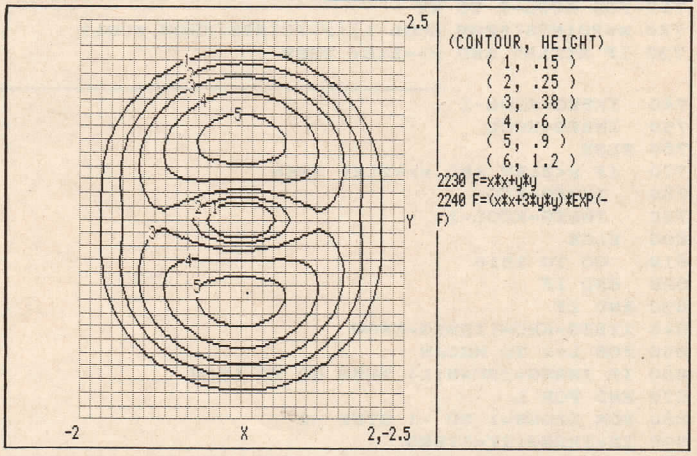
```
335 INPUT £0;"    Name?  WITH DEVICE NAME e.g.mdv2_          (Q)uit  ";name$
336 IF name$="q":RETurn
337 LBYTES  name$,131072:RETurn
338 ELSE
339 bep:PAUSE 100:RETurn
340 END IF
341 GO TO 333
342 END DEFine trap1
343 DEFine PROCedure ove
344 IF b$="x":ov=-1:bep
345 IF b$="z":ov=1:bep
346 END DEFine ove
347 DEFine PROCedure ribbon
348 conv3:FILL 0:fcol=2:scol=4:tcol=7
349 ang =1:inc=9
350 REPeat ar
351 panel2
352  OVER -1:ARC bco,bro TO eco,ero,ang
353 b$=INKEY$(-1):bep
354 OVER -1:ARC bco,bro TO eco,ero,ang
355 curse
356 eco=co:ero=ro
357 IF b$="q":reset:RETurn
358 IF b$="c":OVER 1:arcon:bco=eco:bro=ero
359 IF b$="w":low=1:high=50:inc=1:chodep:pix=value:INK£0,7
360 IF b$="i":col3
361 IF b$="=":ang=ang+.1
362 IF b$="-":ang=ang-.1
363 IF b$="t":ang=-ang:bep
364 inpu
365 begi
366 END REPeat ar
367 FILL 0:conv2:reset
368 END DEFine ribbon
369 DEFine PROCedure arcon
370 CLS£0:num=0
371 FOR nu=1 TO 2
372 num=num+1
373 FOR n=1 TO pix
374 IF num=1:bco=bco+1:bro=bro+1:eco=eco+1:ero=ero+1:INK scol
375 IF num=2:INK fcol:ARC bco,bro TO eco,ero,ang:bco=bco-1:bro=bro-1:eco=eco-1:e
ro=ero-1
376 ARC bco,bro TO eco,ero,ang
377 ARC bco,bro-1 TO eco,ero-1,ang
378 ARC bco,bro-1 TO eco-1,ero,ang
379 ARC bco-1,bro TO eco-1,ero,ang
380 ARC bco-1,bro TO eco,ero-1,ang
381 END FOR n
382 IF num=1:bco=bco-pix:bro=bro-pix:eco=eco-pix:ero=ero-pix
383 IF num=2:bco=bco+pix:bro=bro+pix:eco=eco+pix:ero=ero+pix
384 END FOR nu
385 END DEFine
386 DEFine PROCedure panel2
387 CLS£0
388 AT£0,1,1:PRINT£0;"   (E)nd       (C)onfirm       (I)nks       Angle(+/-) (W
)idth  (T)urn  (Q)uit"
389 END DEFine panel2
390 DEFine PROCedure avoid
391 IF (CODE(b$)>=0 AND CODE(b$)<=42) OR (CODE(b$)>=47 AND CODE(b$)<=59) OR b$="
p"
392 void=0:bep
393 ELSE void=1:bep
394 END IF
395 END DEFine
```

CONTOUR PLOTTER by J R Dormand

Contour plotter draws a specified number of contours in a rectangular region for a mathematical function of two variables or for an equally spaced array of heights input as data. The option of dumping the plot to a printer is provided via the Easel printer dump.

The program allows a user to specify the number of grid points in the horizontal (x) and vertical (y) directions. If the (I)nput option is then selected the appropriate number of heights must be typed in. When the (F)unction option is chosen the program will compute the necessary heights using the FuNction FU (line 2220). The program listing contains an interesting example function: it is a simple matter to change this. The height of each required contour and the ranges of x and y must be specified.

The time required for a plot is proportional to the number of grid points specified.




```
100 REMark CONTOUR PLOTTER BY J.R.DORMAND, version 1.0
110 MODE 4
120 OPEN#4,scr_:WINDOW 320,230,26,3:WINDOW#4,145,230,346,3:WINDOW#0,465,22,26,23
3
130 CLS:CSIZE 3,1:PRINT \'   Contour Plotter'\\'          by'\\'   Dr J.R.Dormand
'\\:CSIZE 0,0:PRINT TO 14;'Version 1.0'
140 CSIZE#0,2,0:CSIZE#4,1,0:PAPER#4,0:INK#4,7:CLS#4
150 INK#0,0:PAPER#0,5:CLS#0:PAPER 0
160 ORX=6:ORY=6
170 INPUT#0,'NO. of X VALUES ';NX;\;'NO. of Y VALUES ';NY
180 NSTOR=NX*NY
190 DIM POINTS(NY,NX),ISCAN(NX),IXSTOR(NSTOR),IYSTOR(NSTOR)
200 PRINT#0,'Input data (I) or Function (F)?':BEEP 2500,10:Qif$=INKEY$(-1):BEEP:
CLS#0
210 CSIZE 2,0
220 IF Qif$=='I' THEN
230  CLS
240  PRINT 'INPUT DATA IN ROWS'
250  FOR J=1 TO NY
260   PRINT '   Row ';J!!
270   FOR i= 1 TO NX
280    INPUT POINTS(J,i)!!
290   END FOR i:PRINT:END FOR J
300 END IF
310 INPUT#0, 'XRANGE LO TO HI',XLO!'to'!XHI\'YRANGE LO TO HI',YLO!'to'!YHI
320 HX=(XHI-XLO)/(NX-1):HY=(YHI-YLO)/(NY-1)
330 INPUT#0,'NO OF CONTOURS ';NCO:DIM ZLE(NCO)
340 FOR i=1 TO NCO:PRINT#0,'CONTOUR ';i,:INPUT#0,ZLE(i):END FOR i
350 IXBEG=0:IWBEG=0
360 IF Qif$=='f' THEN
370  PRINT '    COMPUTING HEIGHTS'
380 FOR i=1 TO NX
390  PRINT#0,'EVALUATING ROW'!i
400 FOR J=1 TO NY
410 POINTS(J,i)=FU((i-1)*HX+XLO,YHI-(J-1)*HY)
420 END FOR J:END FOR i
430 END IF
440 AT#4,2,0:PRINT#4,' (CONTOUR, HEIGHT)'
450 PRINT#0,'LOAD PRINTER DUMP(y/n)?':BEEP 2500,10:QP$=INKEY$(-1):BEEP:CLS#0
460 IF QP$=='Y' THEN
470  ADDR=RESPR(2000):LBYTES MDV1_GPRINT_PRT,ADDR
480 END IF
490 XSIZE=100-2*ORX:YSIZE=100-2*ORY
500 LINE#4,0,0 TO 0,100
510 CLS:CSIZE 0,0
520 CURSOR ORX,ORY,-12,2:PRINT XLO
530 CURSOR ORX+XSIZE,ORY,-30,2:PRINT XHI;',';YLO
540 CURSOR ORX+XSIZE,ORY+YSIZE,2,-5:PRINT YHI
550 CURSOR ORX+.5*XSIZE,ORY,0,2:PRINT 'X'
560 CURSOR ORX+XSIZE,ORY+.5*YSIZE,2,-5:PRINT 'Y'
570 INK 3
580 SCALEX=XSIZE/(NX-1):SCALEY=YSIZE/(NY-1)
590 LINE ORX,ORY :LINE_R TO XSIZE,0 TO 0,YSIZE TO -XSIZE,0 TO 0,-YSIZE
600 INPUT#0,'DRAW GRID(y/n)? ':BEEP 2500,12:Q$=INKEY$(-1):BEEP:CLS#0
610 IF Q$=='Y' THEN
620 FOR i=1 TO NX-2:x=i*SCALEX+ORX:LINE x,ORY TO x,YSIZE+ORY:END FOR i
630 FOR J=1 TO NY-2:y=J*SCALEY+ORY:LINE ORX,y TO XSIZE+ORX,y:END FOR J
640 END IF
650 INK 7
660 FOR CURVE=1 TO NCO
670 ZLEV=ZLE(CURVE)
680 AT#4,CURVE+2,4:PRINT#4,' ( ';CURVE;', ';ZLEV;' )'
```

```
690 KSTOR=0:KSCAN=0
700 FOR KROW=1 TO NY
710 FOR KCOL=2 TO NX
720 x=POINTS(KROW,KCOL-1):y=POINTS(KROW,KCOL)
730 IF x<ZLEV AND y>=ZLEV THEN
740  IXBEG=KCOL-1
750  IWBEG=KCOL
760 ELSE
770  IF y<ZLEV AND x>=ZLEV THEN
780   IXBEG=KCOL
790   IWBEG=KCOL-1
800  ELSE
810   GO TO 1510
820  END IF
830 END IF
840 IYBEG=KROW:IZBEG=KROW
850 FOR L=1 TO KSCAN
860 IF IXBEG=ISCAN(L) THEN GO TO 1510
870 END FOR L
880 FOR IBOUN=1 TO -1 STEP -2
890 IX=IXBEG:IY=IYBEG
900 IW=IWBEG:IZ=IZBEG:IFIRST=1:ISTEP=0
910 IXGO=IW-IX:IYGO=IZ-IY
920 CALC IX,IY,IXGO,IYGO,DIST
930 DX=DIST*IXGO:DY=DIST*IYGO
940 XNEW = (IX-1+DX)*SCALEX+ORX
950 YNEW=YSIZE-(IY-1+DY)*SCALEY+ORY
960 IF ISTEP<>0 THEN
970  IF IXGO*IYGO=0 THEN
980   IXG=IXGO:IYG=IYGO
990   ROTAT IXG,IYG,IBOUN,45
1000   IA=IW-IXG:IB=IZ-IYG
1010   CALC IA,IB,IXG,IYG,DIST
1020   LINE TO XLAS,YLAS
1030   DX=DIST*IXG:DY=DIST*IYG
1040   XLAS=(IA-1+DX)*SCALEX+ORX
1050   YLAS=YSIZE-(IB-1+DY)*SCALEY+ORY
1060  ELSE
1070   IF DIST>.5 THEN
1080    XT=XLAS:XLAS=XNEW
1090    XNEW=XT:XT=YLAS
1100    YLAS=YNEW:YNEW=XT
1110   END IF
1120  END IF
1130 END IF
1140 IF IFIRST <> 1 THEN
1150  LINE TO XLAS,YLAS
1160 ELSE
1170  LINE  XNEW,YNEW
1180 END IF
1190 XLAS=XNEW:YLAS=YNEW
1200 IF IFIRST<>1 AND IX=IXBEG AND IY=IYBEG AND
     IW=IWBEG AND IZ=IZBEG THEN
1210  LINE TO XLAS,YLAS
1220  INK 5:CURSOR XLAS,YLAS,-5,-5:PRINT CURVE:INK 7
1230  GO TO 1510
1240 END IF
1250 IFIRST=0:ISTEP=0
1260 ROTAT IXGO,IYGO,IBOUN,45
1270 IW=IX+IXGO:IZ=IY+IYGO
1280 IF IW<1 OR IW>NX OR IZ<1 OR IZ>NY
     THEN GO TO 1490
1290 IF POINTS(IZ,IW)<ZLEV THEN
1300  ISTEP=1:IX=IW:IY=IZ
1310  ROTAT IXGO,IYGO,IBOUN,135
1320  IW=IX+IXGO:IZ=IY+IYGO
1330  IF IY=KROW THEN
1340   KSCAN=KSCAN+1
1350   ISCAN(KSCAN)=IX
1360  ELSE
1370   IF IY>KROW THEN
1380    KSTOR=KSTOR+1
1390   IF KSTOR>NSTOR THEN
1400    PRINT#0,'WORKSPACE EXCEEDED'
1410    GO TO 1510
1420   END IF
1430  IXSTOR(KSTOR)=IX
1440  IYSTOR(KSTOR)=IY
1450  END IF
1460  END IF
1470 END IF
1480 GO TO 920
1490 LINE TO XNEW,YNEW:INK 5:CURSOR XNEW,YNEW,
     -5,-5:PRINT CURVE:INK 7
1500 END FOR IBOUN
1510 REMark
1520 END FOR KCOL
1530 IF KROW<NY THEN
1540  JSTOR=0:KSCAN=0:NEX=KROW+1
1550  FOR L=1 TO KSTOR
1560  IXT=IXSTOR(L):IYT=IYSTOR(L)
1570  IF IYT=NEX THEN
1580   KSCAN=KSCAN+1
1590   ISCAN(KSCAN)=IXT
1600  ELSE
1610   IF IYT>NEX THEN
1620    JSTOR=JSTOR+1
1630    IXSTOR(JSTOR)=IXT
1640    IYSTOR(JSTOR)=IYT
1650   END IF
1660  END IF
1670 END FOR L
1680 KSTOR=JSTOR
1690 END IF
1700 END FOR KROW
1710 END FOR CURVE
1720 CSIZE#4,0,0
1730 IF Qif$=='f' THEN LIST#4,2230 TO 2249:
     ELSE : PRINT#4, TO 2;'Input data'
1740 IF QP$=='Y' THEN
1750  PRINT#0,'PRINT CONTOURS(y/n)?':BEEP 2500,
      15:Q$=INKEY$(-1):BEEP
1760  IF Q$=='Y' THEN
1770   PAPER#0,0:CLS#0
1780   CALL ADDR
1790   PAPER#0,5:CLS#0
1800 END IF
1810 END IF
1820 STOP
1830 DEFine PROCedure CALC(IXX,IYY,IXF,IYF,DIST)
1840 LOCal IA,IB
1850  IA=IXX+IXF:IB=IYY+IYF
1860  IF IXF=0 OR IYF=0 THEN
1870   DTOP=ZLEV-POINTS(IYY,IXX)
1880   DBOT=POINTS(IB,IA)-POINTS(IYY,IXX)
1890   DIST=DTOP/DBOT
1900  ELSE
1910   PMID=POINTS(IYY,IXX)+POINTS(IB,IA)
1920   QMID=POINTS(IB,IXX)+POINTS(IYY,IA)
1930   ZMID=(PMID+QMID)/4
1940   IF ZMID>=ZLEV THEN
1950    DTOP=ZLEV-POINTS(IYY,IXX)
1960    DBOT=ZMID-POINTS(IYY,IXX)
1970    DIST=.5*DTOP/DBOT
1980   ELSE
1990    DTOP=ZLEV-ZMID
2000    DBOT=POINTS(IB,IA)-ZMID
2010    DIST=.5+.5*DTOP/DBOT
2020   END IF
2030  END IF
2040 END DEFine CALC
2050 DEFine PROCedure ROTAT(IXX,IYY,ISENS,ANG)
2060  IF ANG=135 THEN
2070   IXX=-IXX
2080   IYY=-IYY
2090  END IF
2100  IX1=IXX-ISENS*IYY
2110  IY1=IXX*ISENS+IYY
2120  IXX=IX1/MAX(1,ABS(IX1))
2130  IYY=IY1/MAX(1,ABS(IY1))
2140 END DEFine ROTAT
2150 DEFine FuNction MAX(R,S)
2160  IF R>S THEN
2170   RETurn R
2180  ELSE
2190   RETurn S
2200  END IF
2210 END DEFine MAX
2220 DEFine FuNction FU(x,y)
2230 F=x*x+y*y
2240 F=(x*x+3*y*y)*EXP(-F)
2250 RETurn F
2260 END DEFine FU
```

MICRODRIVE EXCHANGE

READY TO RUN SOFTWARE

Program of the month

Design 3D is one of the biggest programs ever featured in Microdrive Exchange. In addition to the Basic program listed in The Progs, it includes a 2D drawing program and a suite of graphics and filing utilities.

The programs have been linked and compiled using Supercharge and, in total, are more than 60K long. Some of the facilities of the 3D program are explained in The Progs pages. The 2D graphics function includes facilities for drawing arcs, rectangles, triangles and circles, together with commands for their manipulation, such as Rotate.

The utilities are contained in a separate program which can be accessed from the main menu. Facilities include dimensioned text input, re-colour and files. Two extremely useful functions are Pan, which enables you to define a screen block and a move it around; and Mind, with which you can store a part of the screen temporarily on which you are working, in case you make a mess of it.

3D Design is supplied complete with instructions in a Quill document file on the Microdrive.

There is a slight change to the order form this month. Please indicate the numbers (1–24) of the programs you require in the boxes provided.

THE PROGRAMS

Author	Language	Program Name	Price	Issue	Size
1. Giles Todd	(B)	DIY Assembler	£5	Mar/Jun	120
Converts Assembler source into m/c object code					
2. Richard Cross	(AO)	Mini Monitor	£3	Oct	60
Pocket-sized monitor with comprehensive facilities					
3. A Didcock	(B)	Connect4	£1	Sept	15
Pit your wits against the QL					
4. Shergold & Tose	(B)	*Golf	£2	May	35
From fairway to green on 50 courses of varying difficulty					
5. Williams & Holliday	(AO)	Paladin	£5	Apr	70
The basis of our games programming series — a Space Invaders-type game written entirely in machine code					
6. Richard Cross	(MB)	Sprite Animation	£2	Apr	50
A subtle blend of machine code and SuperBasic which produces a versatile sprite designer and high-speed animator					
7. Steve Deary	(B)	Pacman	£1	Mar	20
A reasonably fast rendition of the famous arcade favourite					
8. Andy Carmichael	(B)	Family Tree	£3	Aug	100
Archive program and database for setting-up and displaying large family trees					
9. James Lucy	(L)	Composer	£3	Oct	50
Composer and play sheet music on the QL					
10. Mathew Capp	(B)	Miners	£2	Aug	30
A nail-biting management simulation which puts you in charge of the NCB					
11. P J Smith	(B)	*DIY Adventure	£1	Feb	60
A skeleton framework where you have to slot in the details to create your bespoke adventure					
12. R Green	(B)	Qthello	£1	Aug	25
A 3D version of the well-known board game Othello for one or two players					
13. S J Ackers	(S)	*Touch Type	£4	Aug	80
Touch-typing course — 14 lessons, on-screen keyboard, 800+ word vocabulary and WPM readout					
14. Rob Sherratt	(AO)	FCOPY	£4	Mar'86	80
A machine code Microdrive utility for turbocharged file copying					
15. Alan Prior	(B)	World Map	£2	Mar'86	80
A high-resolution multi-coloured map of the world for geography buffs					
16. J M Dower	(B)	Mushyman	£2	Jun/Jul'86	15
Mushroom munching arcade action					
17. Tony Quinn	(S)	*CAD QL	£4	Sept'86	180
Professional features include rubber banding and user-definable symbol library					
18. Stuart Campbell	(MB)	Attack of the Things	£3	Oct'86	45
Can you repulse the attacking Things?					
19. Karl Jeffery	(MB)	Starport 2001	£3	Nov'86	40
An authentic version of the arcade game Galaxians					
20. Marcus Jeffery	(S)	QL Go	£4	Apr/May'86	40
A must for strategy games enthusiasts					
21. J P Hartrey	(B)	Britain	£2	Nov'86	20
Improve your geography knowledge with this round Britain quiz					
22. KBG Judson	(B)	Darts	£2	Dec'86	30
The popular pub pastime in pixels					
23. Neil Taylor	(S)	Window Designer	£2	Feb'87	40
On-screen window designer					
24. J. F. Tydeman	(S)	Design 3D	£4	Mar'87	200
An extensive utility for the production of 3D Screen designs					

BACK ISSUE ORDER FORM

Name .....

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.....

.....

Issue(s) required .....

Total cost £.....

When ordering back issues, it is best to ensure that the copy you require is available by telephoning Anna Morrison on 01-222 9090. Please enclose a cheque/PO payable to *Sinclair QL World*. Rates for back issues are £2 **per copy** for the U.K., £3 for overseas.

O R D E R F O R M

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No. of programs required		**Total cost of programs**	**£**
No. of drives required		**Drive cost @ £2.50**	**£**
Total sectors (max. 200 per drive)		**Sub total**	**£**
No. of drives sent		**+15% VAT**	**£**
Program 'ID' numbers		**Postage and packing**	**£0.75**
		Total to be sent	**£**

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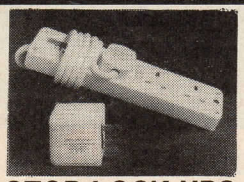
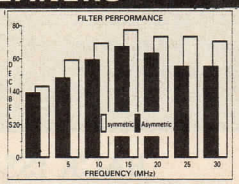
COMPUTER CLEANERS





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EDUCATION

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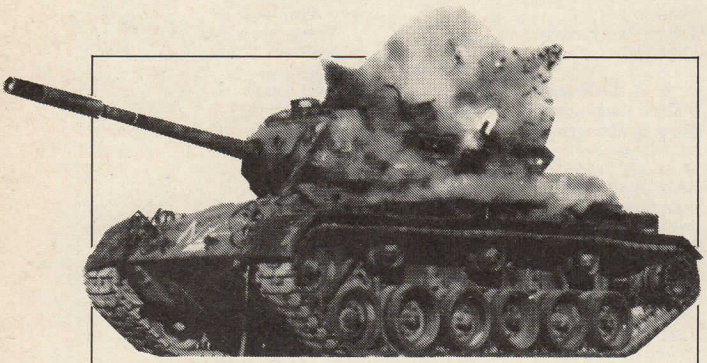

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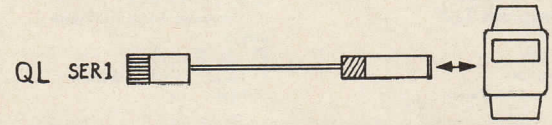

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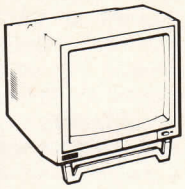

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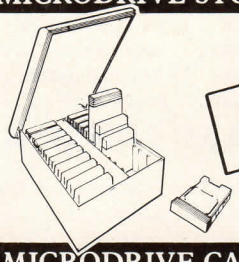

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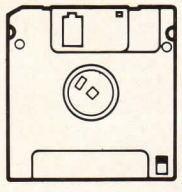

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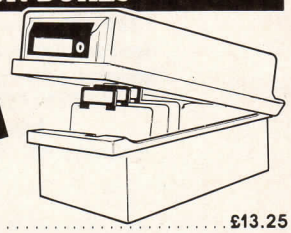

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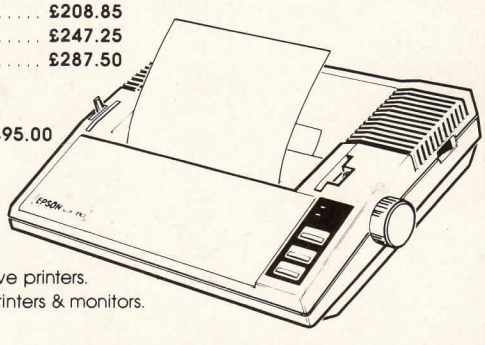

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BRYN COTTAGE, PENIEL, CARMARTHEN, DYFED SA32 7DJ. TEL: 0267-231246

THE ASTRACOM 1000 MULTISTANDARD INTELLIGENT MODEM £198.00
Complete with Communications Software for Prestel Etc.
128K QL Computer ..... £149.00 640K QL Computer £259.00
Special Offer: Silver Reed plotter with Talent Technikit only..... £199.00
Special offer: Psion set of 2.3 software only £9.95 QL Service Manual ..... £ 19.95
QUALITY PRINTER STAND Suitable for any 80 Col Printer ONLY £59.00
Small Footprint & Dial Control for smooth paper feed
QRAM: BY TONY TEBBY - A HOST OF POPUP UTILITIES £29.00

PRINTER PRICES INCLUDE MIRACLE SYSTEMS INTERFACE

Seikosha 1300CPS (colour option £109 extra)	£459.00
Seikosha SP180 with printer stand	£259.00
SEIKOSHA SP180	£219.00
CANON PW1080	£289.00
KAGA TAXAN KP910	£419.00
QUEN DATA DAISYWHEEL	£199.00
2000 Sheets Fanfold paper Micro Perf	£ 19.00
2000 Sheets Fanfold Paper (supplied with printer)	£ 16.00
MIRACLE SYSTEMS PARALELL INTERFACE	£ 20.00

MONITORS (Cables Included)

Microvitic Cub 1451/DQ3 Colour	£249.00
Microvitic Cub 1451/DQT3 with Swivel Stand	£269.00
Swivel Stand for Microvitic	£ 25.00
Phillips BM7502 20MHZ Green (RECOMMENDED FOR THE QL)	£ 99.00

ACCESSORIES

CLEANING KIT IN CARRYING CASE	£ 27.00
3250 WATT MAINS FILTER	£ 36.00
MIRACLE SYSTEMS MODAPTOR	£ 36.00
MICROSTICK JOYSTICK WITH ADAPTOR	£ 16.00
20 CARTRIDGES WITH TRANSFORM BOX	£ 40.00
10 CARTRIDGES WITH TRANSFORM BOX	£ 23.00
4 Microdrive Cartridges	£ 8.00
Transform box	£ 5.00
Joystick Adaptor	£ 5.00
Para Cable for Memodisk	£10.00
Serial Printer Cable	£ 8.00
10 DS/DD 5.25" Disks	£19.00

RIBBONS

BROTHER M1009	£ 5.50	MT80 or Shinwa	£ 6.00
QUEN DATA	£ 6.00	SP1000A (Sinclair)	£ 7.50
TAXAN/CANNON	£ 8.00	EPSON RX/MX/FX	£ 6.50
EPSON LX80	£ 5.00	CITIZEN 120D	£ 6.50

DISK & RAM UPGRADES

MEMODISK includes Disk Interface + 512K RAM + Paraport + Toolkit EPROM
with Multitasking, Windows, Icons RAM disk, Wild Card etc. £199.00

Above with NEC DUAL DRIVES	£399.00
Miracle Systems 512K EXPANDERAM	£ 99.00
Internal D.I.Y. 512K RAM board	£ 99.00
Internal 512K RAM Board fitted by us	£126.00
NEC Dual 3.5" Disk Drives	£209.00
NEC Dual Drives + Interface	£289.00
NEC Dual Drives + Interface + Expanderam or Internal	£379.00
10 quality DS/DD 3.5" disks in library case	£ 26.00
Lockup disk storage box for 40 3.5" disk	£ 14.00
Lockup disk storage box for 90 3.5" disk	£ 18.00
SPECIAL OFFER: 20 3.5" disks + free storage box for 40 disks	£ 58.00

SOFTWARE

BUSINESS

CASH TRADER DISK OR CART	£ 39.00
PROJECT PLANNER	£ 24.00
DESCISION MAKER	£ 24.00
ENTREPRENEUR	£ 24.00
QL HOME FINANCE	£ 21.95
PCB DESIGNER1	£ 89.00
PCB DESIGNER 2	£ 89.00
TALENT TECHNIQL	£ 44.00
CONCEPT 3D CAD	£ 34.00
RUBICON VIEWPOINT	£ 24.95
DIGITAL EYE Q	£ 24.00
QDRAW	£ 14.95
QL PAINT	£ 15.95
SIGN DESIGNER	£ 19.00
FRONT PAGE	£ 22.50
PRO ASTROLOGER CART/DISK	£ 49.00
PRO ASTROLOGER + ASTRONOMER	£ 59.00
THE INVESTMENT MONITOR	£ 19.95

UTILITIES

TOOLKIT II ON EPROM	£ 29.00
DIGITAL MEDIA MANAGER	£ 35.00
TALENT CARTRIDGE DOCTOR	£ 13.00
QMON MONITOR/DEBUGGER	£ 18.00
TURBO TOOLKIT	£ 24.00
QFLASH RAMDISK + TOOLKIT	£ 19.00
BETTER BASIC EXPERT SYSTEM	£ 29.00
EIDERSOFT ICE COMPENDIUM	£ 59.00
EIDERSOFT ICE ROM + CHOICE	£ 39.00
EIDERSOFT ICE TOOLKIT	£ 10.00
EIDERSOFT ICE ARTICE	£ 13.00
EIDERSOFT ICE CHOICE	£ 15.00
EIDERSOFT ICE EPROM	£ 24.00
EIDERSOFT QSPELL DISK	£ 23.00
EIDERSOFT QSPELL CART	£ 20.00
TALENT TECHNIKIT	£ 24.00
TALENT QIMP	£ 39.00
TALENT BASIC-ALLY	£ 29.00
RAM DISK & PRINT SPOOLER	£ 9.00
TALENT SIDEWAYS	£ 19.00
TALENT QL TOOLSET	£ 19.00
SECTOR TASKMASTER	£ 25.00

LANGUAGES

GST MACRO ASSMBLER	£ 34.00
METACOMCO ASSEMBLER	£ 29.00
METACOMCO BCPL	£ 49.00
METACOMCO LISP	£ 49.00
METACOMCO PASCAL	£ 69.00
METACOMCO 'C'	£ 79.00
METACOMCO APL	£ 89.00
PRO FORTRAN 77	£ 89.00
PRO PASCAL	£ 89.00
QL LIBERATOR	£ 69.95
DIGITAL TURBO	£ 79.00
DIGITAL THE EDITOR	£ 24.00
DIGITAL BASIC COMPILER	£ 49.00
DIGITAL FORTH + REVERSI	£ 24.00
TALENT WORKBENCH	£ 24.00

LEISURE

MICRODEAL HOPPER	£ 5.00
MICRODEAL CUTHBERT/SPACE	£ 6.00
MICRODEAL CRAZY PAINTER	£ 5.00
MICRODEAL LANDS OF HAVOC	£ 9.95
MICRODEAL THE KING	£ 14.95
MICRODEAL AQUANAUT 471	£ 18.95
QL CLASSIC ADVENTURES	£ 9.95
QL JABBER	£ 9.95
QL QBOIDS	£ 9.95
QL CAVERNS	£ 9.95
QL BOUNDER	£ 8.00
QL REVERSI	£ 8.00
QL METEOR STORM	£ 8.00
QL THE PAWN	£ 19.95
WAR IN THE EAST COMPLETE	£ 39.00
WAR IN THE EAST (SCEN 1)	£ 20.00
WAR IN THE EAST (SCEN. 2 or 3)	£ 13.00
DIGITAL SPRITE GENERATOR	£ 19.95
DIGITAL SUPERBACKGAMMON	£ 11.95
DIGITAL SUPER ARCADIA	£ 12.95

ADVENTURE WRITING SYSTEM	£ 22.00
DIGITAL SUPER ASTROLOGER	£ 22.95
DIGITAL BLOCKLANDS	£ 9.95
DIGITAL DROIDZONE	£ 9.95
AMBITION	£ 29.95
PYRAMIDE VROOM	£ 14.95
PYRAMIDE WANDERER 3D	£ 19.95
PYRAMIDE MORTVILLE MANOR	£ 18.95
PYRAMIDE NUCLEON	£ 18.95
PYRAMIDE PEINTRE	£ 14.95
PYRAMIDE MR. SMITH	£ 12.95
TALENT WEST	£ 12.95
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TALENT THE LOST PHAROH	£ 13.95
TALENT JUNGLE EDDI	£ 13.95
TALENT NEMESIS	£ 13.95
TALENT NEMISIS + SOUNDTRACK	£ 16.95
TALENT STRIP POKER	£ 13.95
TALENT OXFORD TRIVIA	£ 16.95
RUBICON DRAGONHOLD	£ 14.95
LEISURE GENIUS SCRABBLE	£ 12.95
HYPERDRIVE	£ 12.95
STEVE DAVIS SNOOKER	£ 12.95
DATALINK 3D SLIME	£ 11.95
BRIDGE PLAYER II	£ 17.95
PSION CHESS	£ 16.95
PSION MATCHPOINT	£ 12.95
SQUADRONS	£ 13.95
BARON ROUGE	£ 17.95
GWENDOLINE	£ 17.95
KNIGHT FLIGHT	£ 12.95
DATALINK CADPAK	£ 14.95
EIDERSOFT SPOOK	£ 9.95
EIDERSOFT BJ 3D	£ 9.95
EIDERSOFT BJ RETURNS	£ 9.95
EIDERSOFT KARATE	£ 13.95
EIDERSOFT CITADELL	£ 8.95
SECTOR TOUCH TYPIST	£ 12.00
DS. ENTERPRISES QL MULTITASK	£ 14.95

ALL PRICES INCLUDE VAT & CARRIAGE